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VOLUME I

APPLICATION OF A SYSTEM APPROACH U.S. NAVY MEDICAL DEPARTMENT EDUCATION AND TRAINING PROGRAMS - FINAL REPORT (U) -

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Nurse Training	Task Analysis
Dentist Training	Curriculum Development

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The study objective consisted of a determination of what the health care personnel in the Navy's Medical Department, Bureau of Medicine and Surgery actually do in their occupations; improving the personnel process (education and training); and building a viable career pathway for all health care personnel. Clearly the first task was to develop a system of job analyses applicable to all system wide health care manpower tasks. A means of postulating simplified occupational clusters covering some 50 over

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currently designated Navy enlisted occupations, 20 Naval Enlisted Classification Codes (NEC's) were computerized. A set of 16 groupings that cover all designated occupations was developed so as to enhance the effectiveness of professionals and sub-professionals alike.

FOREWORD

The project, "Application of a System Approach to the Navy Medical Department Education and Training Programs," was initiated in May of 1969 as a realistic, comprehensive response to certain objectives set forth in ADO 43-03X, and to memoranda from both the Secretary of Defense and the Assistant Secretary of Defense, Manpower and Reserve Affairs. The Secretary's concern was stated in his memorandum of 29 June 1965, "Innovation in Defense Training and Education." More specific concerns were stated in the Assistant Secretary's memorandum of 14 June 1968, "Application of a System Approach in the Development and Management of Training Courses." In this he called for "vigorous and imaginative effort," and an approach "characterized by an organized training program with precise goals and defined operational interrelation among instructional system components." He also noted, "Job analyses with task descriptions expressed in behavioristic terms are basic and essential to the development of precise training goals and learning objectives."

The Project

System survey and analysis was conducted relative to all factors affecting education and training programs. Subsequently, a job-analysis sub-system was defined and developed incorporating a series of task inventories ". . . expressed in behavioristic terms . . ." These inventories enabled the gathering of job activity data from enlisted job incumbents, and data relating to task sharing and delegation from officers of the Medical, Nurse and Dental Corps. A data management sub-system was devised to process incumbent data, then carry out needed analyses. The development of initial competency curricula based upon job analysis was implemented to a level of methodology determination. These methods and curriculum materials constituted a third (instructional) sub-system.

Thus, as originally proposed, a system capability has been developed in fulfillment of expressed needs. The system, however, remains untested and unevaluated. ADO 43-03X called for feasibility test and cost-effectiveness determination. The project was designed to so comply. Test and evaluation through the process of implementation has not proved feasible in the Navy Medical Department within the duration of the project. As designed and developed the system does have " . . . precise goals and defined operational interrelation among instructional system components." The latter has been achieved in terms of a recommended career structure affording productive, rewarding manpower utilization which bridges manpower training and health care delivery functions.

Data Management Sub-System

Job analysis, involving the application of comprehensive task inventories to thousands of job incumbents, generates many millions of discrete bits of response data. They can be processed and manipulated only by high speed computer capability using rigorously designed specialty programs. In addition to numerical data base handling, there is the problem of rapidly and accurately manipulating a task statement data base exceeding ten thousand carefully phrased behavioral statements. Through the use of special programs, task inventories are prepared, printouts for special purposes are created following a job analysis application, access and retrieval of both data and tasks are efficiently and accurately carried out, and special data analyses conducted. The collective programs, techniques and procedures comprising this sub-system are referred to as the Navy Occupational Data Analysis Language (NODAL).

Job Analysis Sub-System

Some twenty task inventory booklets (and associated) response booklets) were the instruments used to obtain job incumbent response data for more than fifty occupations. An inventory booklet contains instructions, formatted questions concerning respondent information ("bio-data"), response dimension definitions, and a list of tasks which may vary in number from a few hundred to more than a thousand per occupational field.

By applying NODAL and its associated indexing techniques, it is possible to assemble modified or completely different inventories than those used in this research. Present inventories were applied about three years ago. While they have been rendered in operational format, they should not be reapplied until their task content is updated.

Response booklets were designed in OPSCAN mode for ease of recording and processing responses.

Overall job analysis objectives and a plan of administration were established prior to inventory preparation, including the setting of provisional sample target sizes. Since overall data attrition was forecast to approximate twenty percent, final sample and sub-sample sizes were adjusted accordingly. Stratified random sampling techniques were used. Variables selected (such as rating, NEC, environment) determined stratifications, together with sub-population sizes. About fifteen percent of large sub-populations were sought while a majority of all members of small sub-populations were sought.

Administration procedures were established with great care for every step of the data collecting process, and were coordinated with sampling and data analysis plans. Once set, the procedures were formalized as a protocol and followed rigorously.

Instructional Sub-System

Partial "competency curricula" have been composed as an integral sub-system bridging what is required as performance on the job with what is, accordingly, necessary instruction in the training process. Further, curriculum materials were developed to meet essential requirements for implementing the system so that the system could be tested and evaluated for cost effectiveness. However, due to the fact that test and evaluation was not feasible in the Navy Medical Department within the duration of the project, it was not possible to complete the development of the system through the test and evaluation phase.. The inability to complete this phase also interrupted the planned process for fully developing the curricula; therefore, instead of completed curricula ready for use in the system, the curricula were partially developed to establish the necessary sub-system methodology. The competency curricula are based on tasks currently performed by job incumbents in 1971. (The currency of a given curriculum depends upon periodic analysis of incumbents' jobs, and its quality control resides in the evaluation of the performance competency of the program's graduates.)

A competency curriculum provides a planned course of instruction or training program made up of sequenced competency units which are, in turn, comprised of sequenced modules. These modules, emphasizing performance objectives, are the foundation of the curriculum.

A complete module would be comprised of seven parts: a cluster of related tasks; a performance objective; a list of knowledges and skills implied by the objective; a list of instructional strategies for presenting the knowledges and skills to the learner; an inventory of training aids for supporting the instructional strategies; a list of examination modes; and a statement of the required training time. In this project, curriculum materials have been developed to various levels of adequacy, and usually comprise only the first three parts; the latter four need to be prepared by the user.

The performance objective, which is the most crucial part of the module, is the basis for determining curriculum content. It is composed of five essential elements: the stimulus which initiates the behavior; the behavior; the conditions under which the behavior takes place; the criteria for evaluating the behavior; and the consequence or results of the behavior. A sixth element, namely next action, is not essential; however, it is intended to provide linkage for the next behavior.

Knowledges and skills listed in the module are those needed by the learner for meeting the requirements of the performance objective.

Instructional strategies, training aids, examination modes and training time have been specified only for the Basic Hospital Corps Curriculum. The strategies, aids and modes were selected on the basis of those considered to be most supportive in presenting the knowledges and skills so as to provide optimum learning effectiveness and training efficiency. The strategies extend from the classroom lecture as traditionally presented by a teacher to the more sophisticated mediated program for self-instruction. The training aids, like strategies, extend from the traditional references and handout material in the form of a student syllabus to mediated programs for self-instruction supported by anatomical models. Examination modes extend from the traditional paper and pencil tests to proficiency evaluation of program graduates on the job, commonly known as feedback. Feedback is essential for determining learning effectiveness and for quality control of a training program. The kind of instructional strategies, training aids and examination modes utilized for training are limited only by such factors as staff capability and training budget.

The training time specified in the Basic Hospital Corps Curriculum is estimated, based upon essential knowledge and skills and program sequence.

The competency curriculum module, when complete, provides all of the requirements for training a learner to perform the tasks set forth in the module. A module may be used independently or related modules may be re-sequenced into modified competency units to provide training for a specific job segment.

Since the curricula are based upon tasks performed by job incumbents in 1971, current analysis of jobs needs to be accomplished using task inventories that have been updated to reflect changes in performed tasks. Subsequent to job analysis, a revision of the curricula should be accomplished to reflect task changes. When the foregoing are accomplished, then faculty and other staff members may be indoctrinated to the competency curricula and to their relationship to the education and training system.

In addition to the primary use for the systematic training of job incumbents, these curricula may be used to plan for new training programs, develop new curricula, and revise existing curricula; develop or modify performance standards; develop or modify proficiency examinations; define billets; credentialize training programs; counsel on careers; select students; and identify and select faculty.

The System

Three sub-systems, as described, comprise the proposed system for Education and Training Programs in the Navy Medical Department. This exploratory and advanced developmental research has established an overall methodology for improved education and training incorporating every possible means of providing bases for demonstrating feasibility and cost effectiveness. There remains only job analysis sub-system up-dating, instructional sub-system completion, and full system test and evaluation.

Acknowledgements

The authors wish to acknowledge the invaluable participation of the several thousands of Naval personnel who served as respondents in inventory application. The many military and civilian personnel who contributed to developmental efforts are cited by name in the Final Report.

The authors also wish to acknowledge former colleagues for singularly important contributions, namely, Elias H. Porter, Ph.D., Carole K. Kauffman, R.N., M.P.H., Mary Kay Munday, B.S.N., R.N., Gail Zarren, M.S.W., and Renee Schick, B.A.

Identity and acknowledgement of the project Advisory Group during the project's final year is recorded in the Final Report.

Lastly, the project could not have been commenced nor carried out without the vision, guidance and outstanding direction of Ouida C. Upchurch, Capt., NC, USN, Project Manager.

PART I

PROJECT'S OBJECTIVES, METHODOLOGY, AND PROGRESS

CAPTAIN OUIDA C. UPCHURCH

APPLICATION OF A SYSTEMS APPROACH TO THE NAVY MEDICAL DEPARTMENT EDUCATION AND TRAINING PROGRAMS

This project was one of the five projects that comprised the overall Bureau of Medicine and Surgery Education and Training Development Project. As set forth in the Technical Development Plan[1] this project and the one concerned with the modernization of the basic Hospital Corps school curriculum were closely interrelated. This project was concerned with the development and feasibility testing of an overall education and training system and the basic Hospital Corps school project was involved in the development and feasibility testing of a specific part of the overall system at the level of one training program. The overall plan called for an integration of these two projects during their final year. However, the basic Hospital Corps school project was terminated administratively in 1972. This project has not been tested for feasibility.

The purpose of A System Approach to Navy Medical Department Education and Training Project was to provide for increased learning effectiveness and/or efficiency for the Navy Medical Department education and training programs. The objective of the project was to develop and test the cost-effectiveness of a closed loop approach to these education and training programs. This system approach commences with job analyses followed by the development of curricula and feedback from the field on performance proficiency. The job analysis provides the basis for curriculum development and field feedback provides the quality control.

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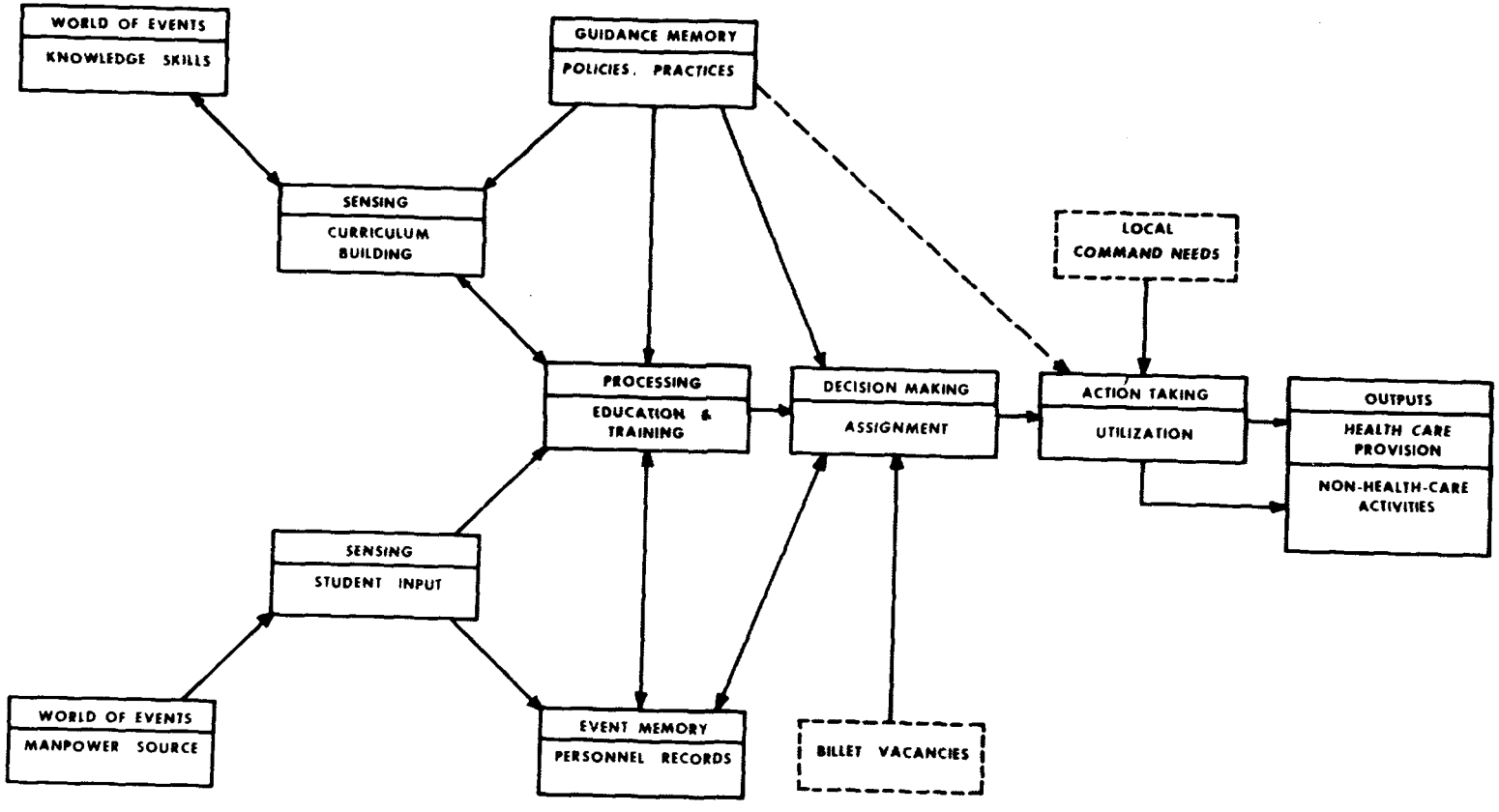
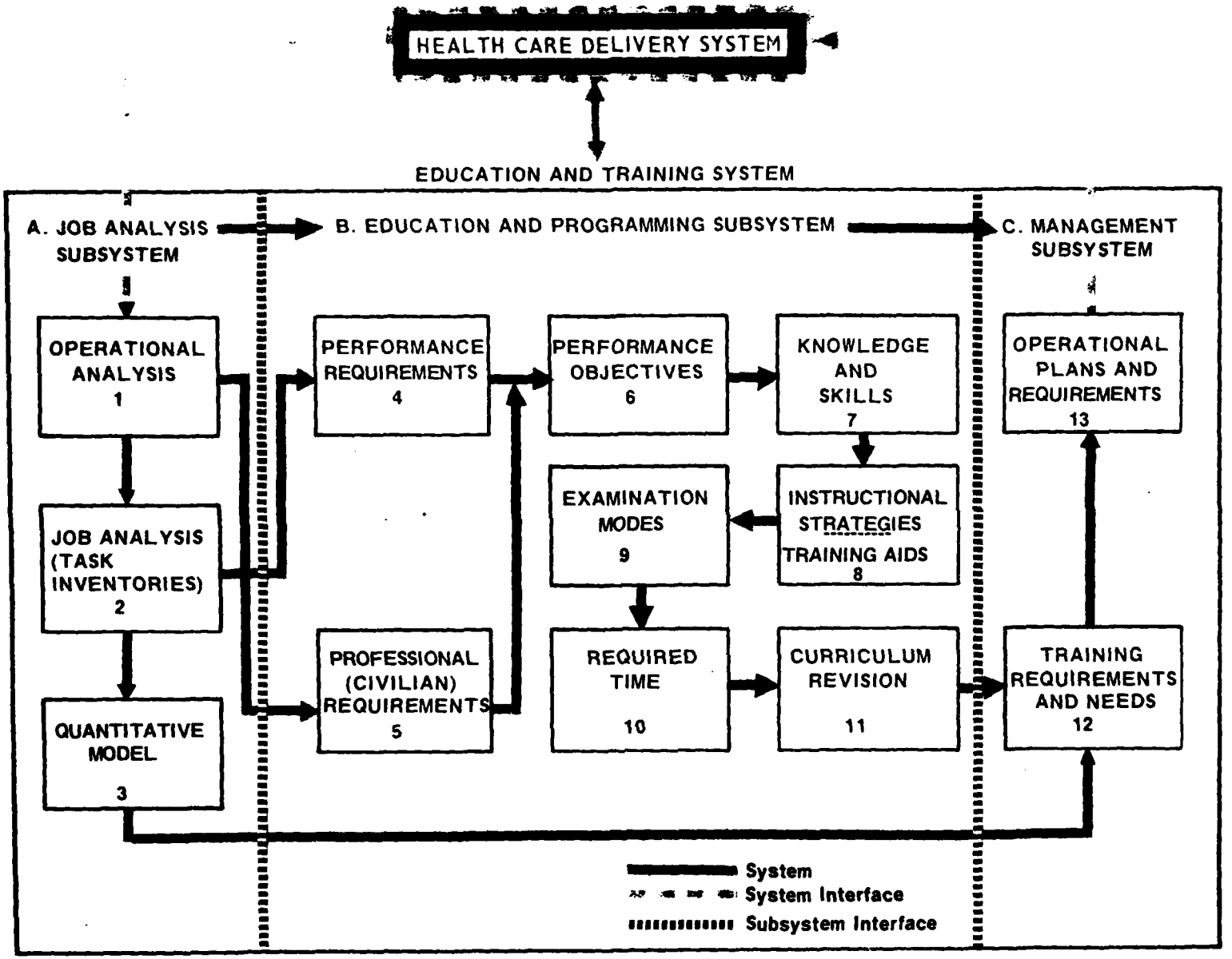
[1]Bureau of Naval Personnel, Department of the Navy, Technical Development Plan 43-03X (Washington, DC: 1 April 1970).

EDUCATION AND TRAINING SYSTEM FUNCTIONS



The functions of an education and training system process in the health field include the bringing together of knowledges and skills in the form of curricula and the learners to be educated and trained. Education and training takes place and decisions are made relative to the employment or assignment of the graduates. Once within the job, administration's utilization of the graduates' capabilities determine their output -- providing health care or contributing to non-health care activities. Their performance proficiency reflects the effectiveness of their training.

Although the functions of the education and training process appear to be very straight forward, extending from input through output, these functions are impacted by administration policies and practices concerned with curriculum, student selection criteria, the education and training process, and the employment or assignment and the utilization of the graduates.


HEALTH CARE DELIVERY SYSTEM
EDUCATION AND TRAINING SYSTEM
A. JOB ANALYSIS SUBSYSTEM
B. EDUCATION AND PROGRAMMING SUBSYSTEM
C. MANAGEMENT SUBSYSTEM
OPERATIONAL ANALYSIS 1
JOB ANALYSIS (TASK INVENTORIES) 2
QUANTITATIVE MODEL 3
PERFORMANCE REQUIREMENTS 4
PROFESSIONAL (CIVILIAN) REQUIREMENTS 5
PERFORMANCE OBJECTIVES 6
KNOWLEDGE AND SKILLS 7
INSTRUCTIONAL STRATEGIES TRAINING AIDS 8
EXAMINATION MODES 9
REQUIRED TIME 10
CURRICULUM REVISION 11
TRAINING REQUIREMENTS AND NEEDS 12
OPERATIONAL PLANS AND REQUIREMENTS 13
System
System Interface
Subsystem Interface

A system is composed of subsystems which are closely related and which interlock. Every system is a part of a larger system; therefore it interfaces with other subsystems within that system. Any change within the subsystems of a system effects change in the other subsystems of that system directly proportionate to the approximation of the subsystems. Changes in the Navy Medical Department education and training system results in changes in the personnel and health care delivery systems.

The Navy Medical Department education and training system is composed of three subsystems -- the job analysis, education and programming or curriculum development, and management. The job analysis subsystem provides for an analysis of the operations within an occupational field, such as allied health. The data from this analysis -- number, kind, distribution, and the education and training of personnel -- is essential to the conduct of the job analysis.

Job analysis, accomplished by tasks' inventories, provides the performance requirements or tasks for developing curriculum. Job analysis generates data on manpower requirements and utilization which provides the education and training management subsystem essential information for determining training needs and requirements. It also provides the personnel system with manpower data.

The education and programming or curriculum subsystem generates new or modifies existing curriculum, based upon an analysis of the task inventory data. The development of performance objectives, identification of knowledge and skills to ensure performance competency, selection of instructional strategies and training aids to provide optimal training, and the establishment of a time frame in which to accomplish the training are all essential steps in curriculum development or revision.

Considering training needs in terms of manpower requirements and competency curriculum based upon performed tasks, education and training management can plan to meet its operational requirements. The meeting of these requirements provides the personnel system with effectively trained personnel who can optimally meet the needs of the health care system.

ASSESSMENT OF EXISTING SYSTEMS

NAVY MEDICAL DEPARTMENT

SURVEY
RESULTS

CAREER FORUMS

PROCESS
RECOMMENDATIONS

JOB ANALYSIS

ARMY-AIRFORCE
LABOR DEPT.
H.E.W.
CANADIAN FORCES

The assessment of the existing system in 1969 included a six month survey and analysis of the Navy Medical Department education and training programs, a series of career forums, and a survey and analysis of technologies used in conducting occupational and job analysis.

The six month survey and analysis of the Navy Medical Department education and training programs included visits to approximately 85 training activities, a review of about 200 training programs, interviews with more than 1000 personnel as well as a collection of about 3500 training documents. These were documented, indexed, and transferred to the Naval Medical School to form the basis of a contralized library of training materials. The strengths and weaknesses of the 1969 education and training programs were listed, trends and activities in the civilian sector, which are counterparts of the Navy's allied health field were described. Recommendations were made that included the centralization of education management functions, the regionalization of training programs, and the development of a career structure that would provide for optimal training and utilization of all enlisted personnel as well as career development for them.[1]

A series of 24 career forums were conducted with the objectives of developing career fields, including duties and tasks. The 25th forum composed of flag rank officers recommended: career planning supported by education - basic through graduate; the opportunity to remain in one's speciality; regionalization of training supported by a professional education staff with programs that meet accreditation standards; that organizational status be given to education and training within the Medical Department; and that the Medical Department be responsible and accountable for health care delivery. -- 122 officers and 59 enlisted personnel participated in these forums.[2]

A survey was made of occupation and job analysis technology in the Army, Air Force, Labor Department, civilian community and Canadian Forces. The latter has the most advanced technology which served as a basis for that developed in this project.3

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[1]Medical Education and Training Systems Survey, Vol. I, Technomics Inc., 29 August 1969.

[2]Education System Requirements for Meeting Future Health Care Delivery Demands, Vol. I, January 1970, Technomics Inc.

[3]Op. Cit., 1

CENTRALIZED EDUCATION AND TRAINING SYSTEM

(EDUCATION AND TRAINING COMMAND)

ADMINISTRATION

- FACILITIES
- RESOURCES
- PERSONNEL

COORDINATION

- TRAINING CENTERS
- PERSONNEL MANAGEMENT
- CIVILIAN AGENCIES

EDUCATION AND TRAINING SYSTEM PROCESS

- JOB ANALYSIS
- CURRICULUM DEVELOPMENT
- EVALUATION

At the conclusion of the first six months project effort the Surgeon General in a memorandum for the contractor for this project[1] stated the following objectives with specific guidance:

> Objective: To develop a centralized education and training management system commencing with the Bureau of Medicine and Surgery.
>
> Specific Guidance: The education and training management system to be developed must reflect the Chief of Naval Operations' stated direction that a systems approach will be applied to all our training requirements. This includes the establishment of a propriety education and training data system as a prerequisite for the contral management of education and training, continuing job analysis, and quality control feedback systems.
>
> Results: A data management system has been developed that provides a task data bank with approximately 12,000 valid tasks for the Navy Medical Department that are retrieveable by numerical and language codes; a capability to build or modify task inventories for job analysis;and to analyze inventory data according to identified dimensions, commonality of tasks across personnel categories, identify lateral mobility at various levels of career development and to optimize manpower requirements and utilization on a cost-effectiveness basis. A quality control feedback system has not been developed.
>
> An assessment of existing facilities and the current billet allowance indicated that the system can be implemented for feasibility testing. The annual cost of implementation, without the feedback system, would be approximately $300,000 over a three year period at which time it is anticipated that the cost benefits realized from the system would exceed the $300,000 required for initial implementation.

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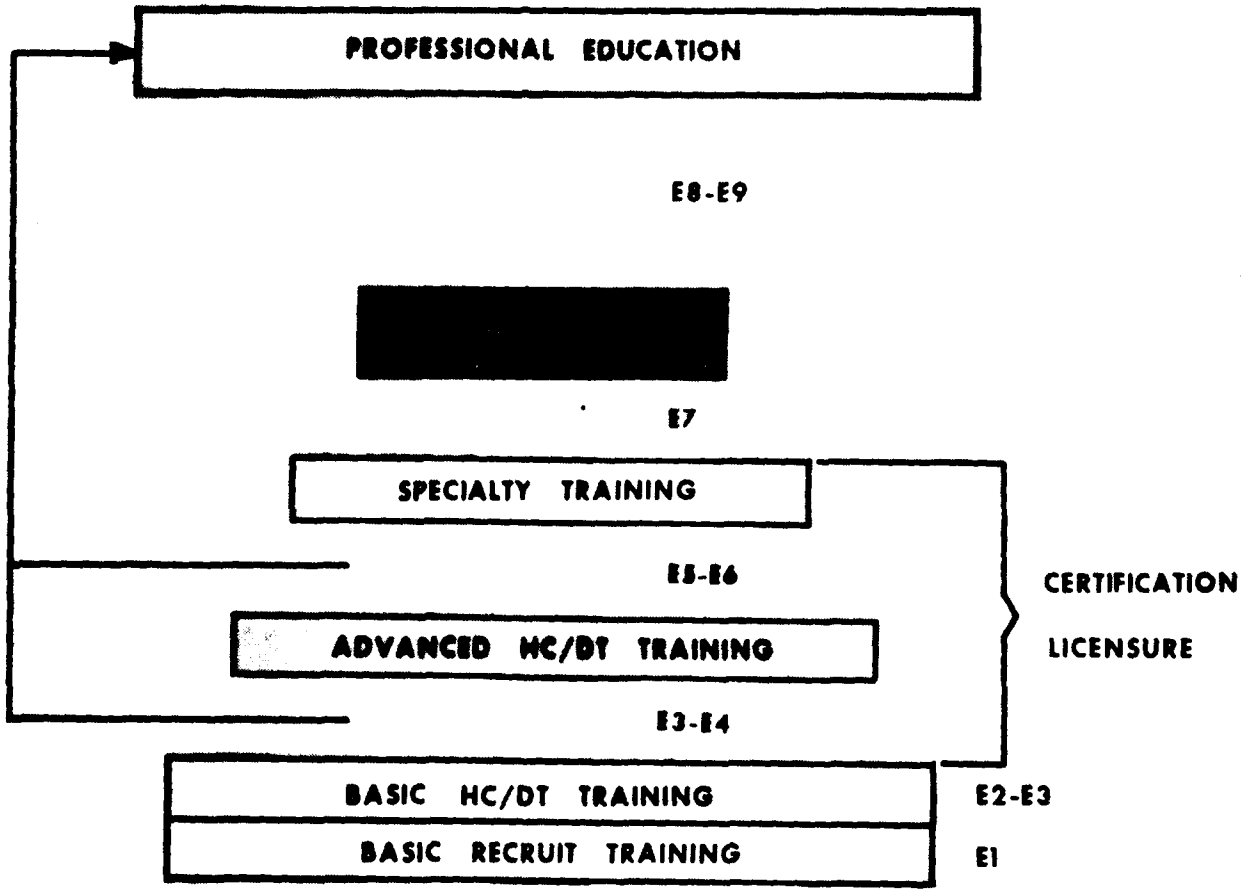
[1]Memorandum for the Contractor for Subproject 43-03X.02, BUMED-71;ems, dated 17 November 1969, subject: Guidance Directive for the Application of A System Approach to the Navy Medical Department Education and Training Programs, signed by G. M. Davis.

CAREER MANAGEMENT AND TRAINING

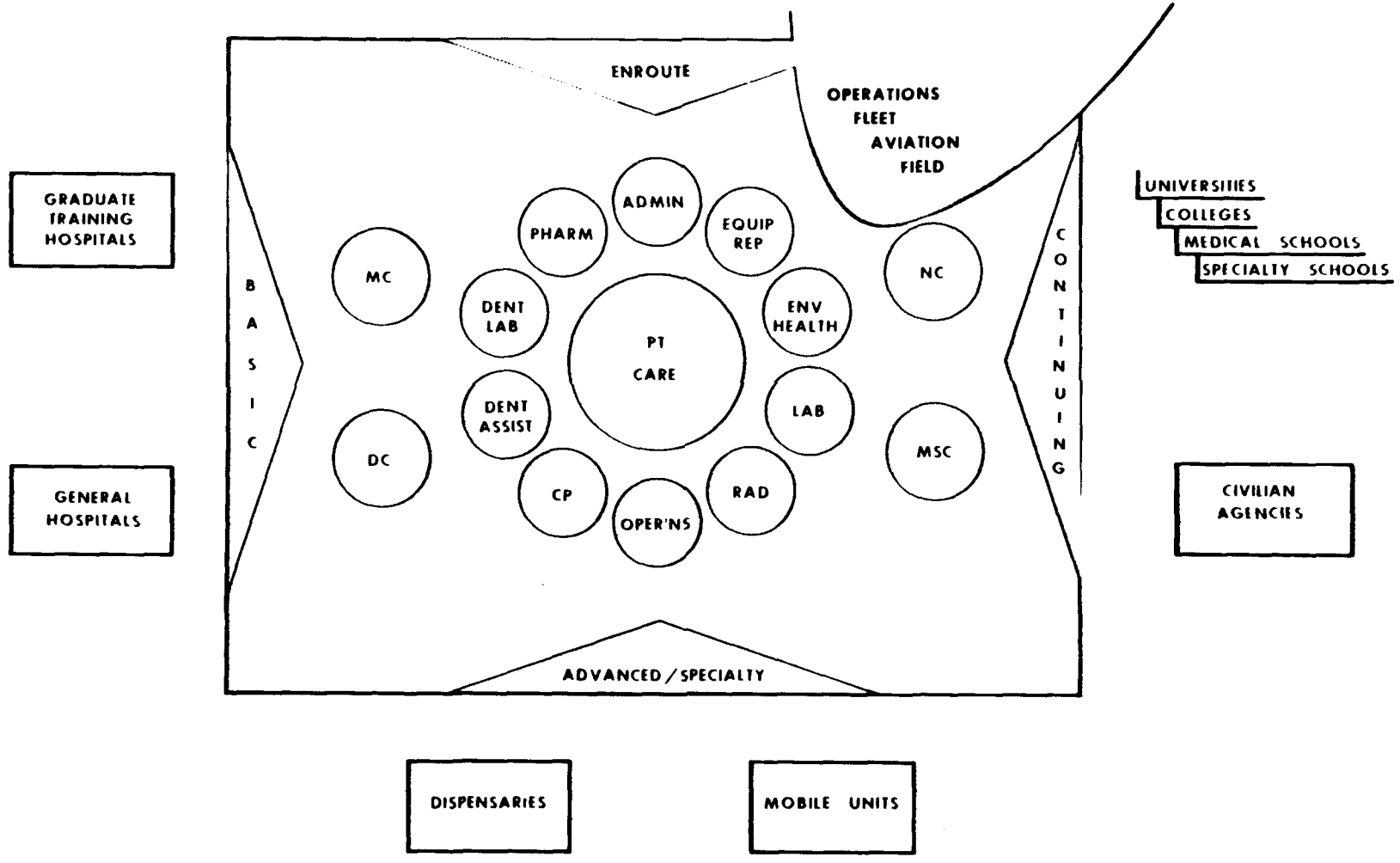


Objective: To improve individual career management and training.

Specific Guidance: A revision and augmentation of career management should recognize the need to rotate our personnel with a relevance that blends service requirements and personal goals with educational programs that will serve both.

Results: The career system developed provides eleven career fields through which personnel in the enlisted health occupations may advance. Basic, advanced, and speciality training support this advancement. Possessing the capibility, they may seek advancement into the professional fields on a competitive basis. Normal service requirements would be met with personnel being rotated with assignment within their speciality.

REGIONALIZED NAVY MEDICAL DEPARTMENT EDUCATION AND TRAINING MODEL

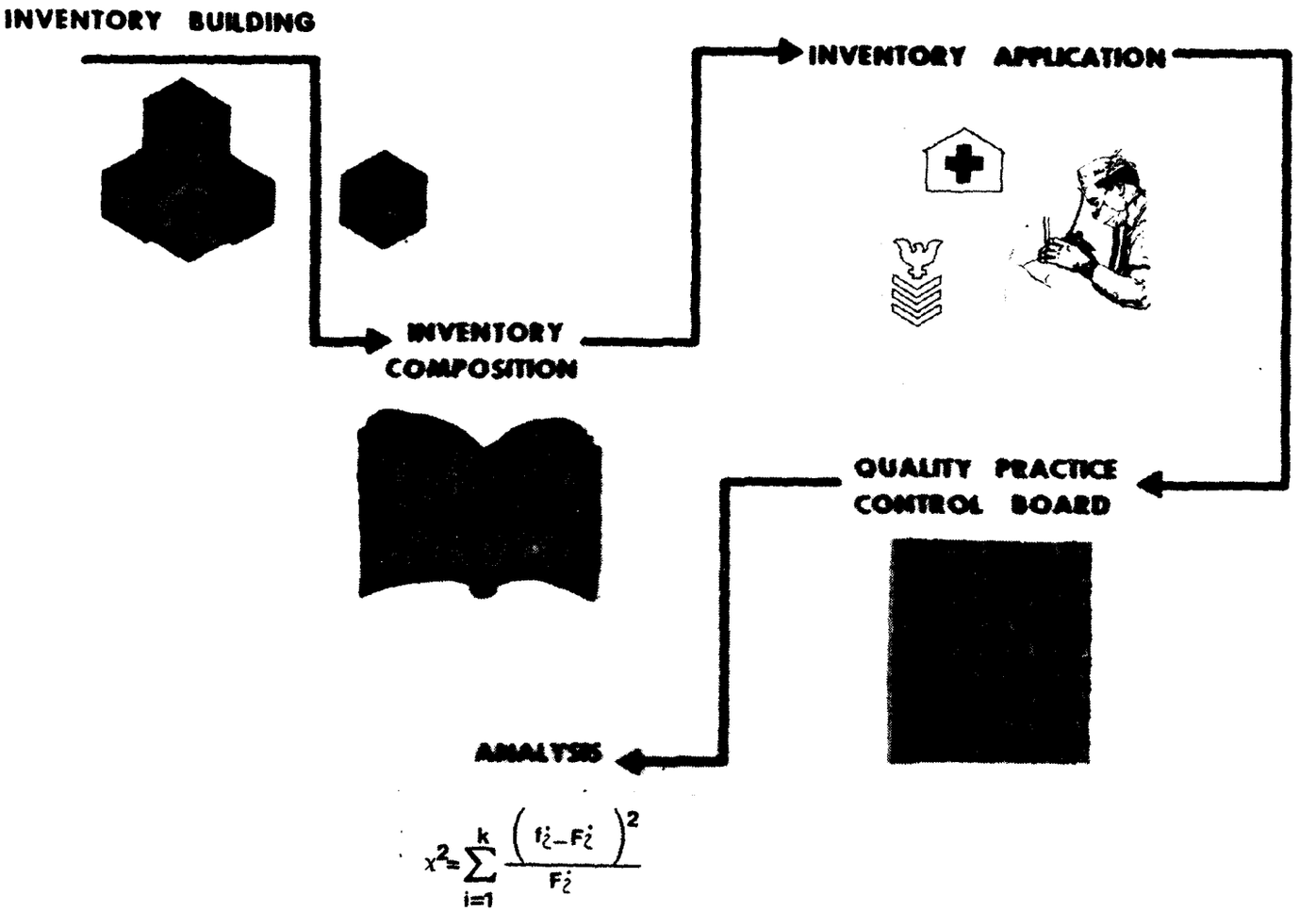


Objective: To develop, establish, and evaluate a model regional medical training center.

Specific Guidance: The model of the regional medical training center will be developed around a major leading hospital in an active fleet area and will exploit to the fullest the advantages to be accrued from a coordinated training system providing optimum educational services to the entire area. Particularly attention will be given the services and benefits accruing to the fleet and satellite commands and facilities, most especially the vigorous support of the dispensaries.

Results: Regionalization for providing health care and the centralization of training under training commands has been instituted operationally. However, the regionalization of training as a part of the system has not been developed. The development of such a region would provide for the feasibility testing of competency curricula and the generating and testing of a feedback system. Also, the testing of new innovations, such as computer aided management and computer aided instruction could be accomplished as well as the relationship of didactic and practical learning and the use of professional educational staffing. It could become the nucleus for educational experimentation and/or feasibility testing for the Navy Medical Department.

OCCUPATIONAL ANALYSIS



$$x^2 = \sum_{i=1}^{k} \frac{\left(f_i - F_i\right)^2}{F_i}$$

The development of the occupational analysis technology for the Hospital Corps and Dental Technician fields consisted of five major steps. There were:

1. Inventory Building: Inventories were built for each of the 16 career fields, plus a cross speciality one. Inventory building included the following steps:
   - -Collecting and listing all feasible tasks within each field.
   - -A critical review and revision of the list by five or six qualified job incumbents, each working with a staff member for about 40 hours.
   - -The establishment of functional areas with numerical codes and the assignment of each task to a functional area. Each task was assigned a numerical code number within the functional area.
   - -A critical review and revision of the initial inventories by a series of four to five panels, each consisting of three to seven members. Each panel worked about 8 hours in collaboration with a staff member.
   - -A pilot study using job incumbents and their supervisors.[1]

2. Inventory Composition: Each inventory was comprised of two parts: biographical and environmental information and tasks with task dimensions.[2]

3. Inventory Application: The inventories were applied to a stratified random population sample for response. The sample was stratified by career fields, grade, and environment. The total sample of 4475 represented 15.8 percent of the total population. The application process provided for tight control and accountability as well as respondent anonymity. Approximately two hours were required by each respondent to complete his inventory.[3]

4. Quality Practice Control Boards: These boards were composed of Navy practitioneers and supervisors in each career field and their counterparts from the civilian community. Also present were civilian representatives from certification and/or accreditation activities. Ninety-six officers, 82 enlisted, and 61 civilians participated in the 16 boards. Each board was convened for a period of three days. Each board was provided with summaries of the inventory data from the field, information on the current Navy training in their field, and current trends in the field in the civilian community. Each board's output consisted of a

deletion of inappropriate tasks, the development of a career ladder with tasks assigned to each level, and a set of recommendations considered to be appropriate for their field.[4]

5. Analysis: Numerous analyses of the inventories' data have been made. These include an analyses

- -of the tasks' dimensions according to biographical and environmental variables;
- -to determine tasks common to two or more personnel categories;
- -to determine tasks delegable from professional to technical personnel;
- -to determine lateral mobility of allied health personnel;
- -to determine optimization of manpower utilization;
- -of the task as reported by personnel according to grade and as assigned by the Quality Practice Control Boards to grade level.

Inventories for the physicians, dentists, and nurses were structured, applied, and analyzed in the same procedural way as those for the Hospital Corps and Dental Technician personnel.

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[1]Mid-Project Status and Plan Report, Vol. I, Technomics Inc., 21 April 1971.

[2]Ibid.

[3]Ibid.

[4]Job Analysis Techniques for Restructuring Health Manpower Education and Training in the Navy Medical Department (with 16 attachments), Technomics Inc., 29 March 1972.

[5]Summary of Fourth Year Activity: A System Approach to Navy Medical Department Education and Training, Technomics Inc., 31 January 1973.

CURRICULUM DEVELOPMENT

CURRICULUM DEVELOPMENT PANELS

TECHNICAL REVIEW

CRITICAL REVIEW

TRAINING MODULE

TASK CLUSTER

PERFORMANCE OBJECTIVE

KNOWLEDGES AND SKILLS

INSTRUCTIONAL STRATEGY

TRAINING AIDS

EXAM MODES

TIME

SEQUENCED INTO TRAINING UNITS

A competency curriculum is based upon tasks performed in a job. The curriculum is organized in modular form with the modules sequenced into learning units, which in turn are sequenced into a curriculum. Each module is an independent unit and may be used in multiple curricula.

Each training module is composed of a cluster of closely related tasks for which a performance objective is developed, knowledge and skills are identified to support the objective, and instructional strategies are suggested. Training aids are suggested that support the instructional strategies. Also, examination modes are proposed. The training time required is estimated -- the real time to be determined on implementation for feasibility testing or for use.

The performance objective, which is probably the most critical substance of the modules, consists of six elements:

-Stimulus -- initiates the action;
-Behavior -- action to be taken;
-Conditions -- under which the behavior takes place;
-Consequence -- results of the action;
-Criteria -- for evaluating action and action results;
-Next Action -- a subsequent action is usually, but not always, identified.

The behavior, conditions, and criteria elements of the performance objective are the performance standards for a job. The performance objective is the basis for evaluating the graduates' performance proficiency.

The process for the development of the competency curricula included the initial development effort by 17 Curriculum Development Panels followed by technical and critical reviews. In the Curriculum Development Panels, 34 officers, 66 enlisted, and 7 civilians participated and approximately 125 civilian educators have been involved in the technical and critical reviews.

PART II

PROJECT'S TECHNOLOGICAL CAPABILITIES AND THEIR APPLICATION

DR. ROBERT B. PARKS

R & D PRODUCTS

Operational System Technology

Many interim and final discrete products will be available as a result of this full program of research and development. They may conveniently be grouped as indicated in Figure 1: the Data Management System, Data Analyses, the Curricula, and User Documentation. Together these four clusters of complementary products provide an overall operational system technology for accomplishing improved enlisted education and training in the Navy Medical Department. While each of the four major products complement one another, they form, in fact, a single major product, that of the technology for improved training.

Data Management System (Figure 2)

The project has made fundamental and extensive use of task inventories to determine what personnel do in their jobs. This information has become the basic building block for all subsequent development. It is important that a final subproduct include the capability to generate new or altered task inventories with the facility of the computer. The R & D phase of the project has of necessity built the initial task inventories manually. It was anticipated that this expensive and time-consuming function should be reduced as much as possible to computer-generated output for operational purposes. Appropriately, software has been written for the purpose of producing routine as well as special task inventory instruments.

It has been apparent from the period of early research that the resulting task data base would be very large and very complicated. A first step toward making that data base manipulable was the decision to give unique numerical identity to each task using a six digit system. This functional coding has served its research purposes well for access and retrieval. However, for operational use, it became apparent that an English language index and retrieval system would be necessary for the completion of research analyses as well as for access and retrieval by the operational user. A software capability has been programmed to be responsive to this index and retrieval system.

A great deal of raw data must be processed as a result of task inventory sampling. Literally millions of pieces of information are gathered when sampling a large population. Software has been prepared which accepts and processes this information, placing it in designated formatted files, thus making the data

suitable for descriptive reporting or for special analyses.

Special Data Analyses

Numerous interdependent data analyses have been conducted in the course of this research and some are still on-going. Most are near completion.

Of basic importance to both researchers and users is the reliability and validity of the instruments employed in the research, namely, the task inventories. Methods and indices for the establishment of reliability and validity measures have been reported to this Committee in earlier meetings. Since these matters have been emphasized, and an extensive paper on these topics has been provided the Committee, it is sufficient to say at this time that adequate reliability and validity have been demonstrated.

A number of analyses have focused on the potential for health manpower optimization in the Navy Medical Department environments. While this project has as its principal focus an intent to improve the education and training processes for enlisted personnel, it has been necessary to visualize inproved utilization in order to take advantage of the improved training technologies. Again, based upon task analysis data, recent and current analyses will recommend parameters for manpower optimization. Some of the highlights of these analyses will be reported upon today.

Yet to be completed are certain analyses having to do with comparative statistics regarding what was found to be performed on the job as versus what was recommended performance on the part of the Quality Practice Control Boards.

It will be evident, as noted in Figure 3, that the cumulative impact of completed analyses offers the prospect of more objective guidelines for manpower decision-making than is ordinarily available to those who must render such decisions.

Curricula

Curricula that are derived from task analysis result in what might be termed need-to-know essentials for proficient job performance. These essentials are the things that job analysis has determined must be known at a given level of proficiency but in no way exclude or rule out any other desirable education or training that may be required of the individual. For example,

it may be determined from job analysis that only four weeks need be consumed in achieving a desired range of skills at a given level of proficiency. On the other hand, accreditation requirements may result in an expansion of knowledge acquisition. Curricula developed within this project do not account for extraneous requirements but only intrinsic need-to-know.

It should be equally clear that by definition the curricula should be thought of as competency-based. The objective is to train the person to the desired level of competency in the shortest possible time.

With these curricula characteristics built-in, the R & D objective of achieving cost effectiveness in an operational system will have been anticipated to the greatest possible extent.

Collectively, as may be noted in Figure 4, the curricula are intended to establish objective standardization for entry training and continuing education of individuals throughout the enlisted component.

User Documentation

Inventories become unreliable, hence productive of invalid data, if improperly used. A rigid administrative protocol must control the administration of all inventories for job analysis purposes. Necessarily, guidelines, instructions and rules of procedure will be documented.

The use of curricula materials generated may be envisioned in numerous ways, some of which will be pointed out in later presentations. As in the case of inventories, however, any given application requires qualifications and strategies as well as cautions. Therefore, user guidelines for curricula materials will be documented.

While the computer software comprising the Data Management System is internally complicated, it is deceptively simple in its output and its manipulation by a user not skilled in electronic data processes. This will be reflected in uncomplicated instructional user documentation. However, in order to understand, manipulate, maintain, modify or add to the software, it is necessary that a highly skilled senior programmer have in hand a detailed, sophisticated user manual. This manual is being documented.

Thus, in Figure 5, we see the several varieties of user

documentation leading to an orderly installation of the system.

Curricula Status

Figure 6 depicts three principal stages of curricula development at the present time. First, on the left are those curricula which are still in some aspect of stages of development and/or technical review. In other words, they still require heavy effort.

Curricula listed in the center box are either still in the technical review process or in some instances advanced to the critical review process, but not sufficiently advanced to be listed in the third box. Nonetheless, there is wide variation in the state of review of curricula in the middle box. For example, dental assisting will move very quickly to the last stage while others will require up to several months for that transition. In the right hand box are listed those curricula which are either in the final stages of review or in the last stage of documentary completion on the part of the project staff.

As noted in the bottom box in Figure 6, a few curricula have not been attempted because the original task analysis survey did not yield sufficient information from Navy personnel to provide an adequate basis for curriculum development.

It will be evident that project effort associated with the various stages of curriculum work requires the greatest remaining amount of attention.

User Guidelines: Curricula

Figure 7 lists the anticipated narrative Sections which will comprise user guidelines as bound into each curriculum document. The first five Sections will probably not vary from one document to another. The remaining two Sections, particularly that having to do with strengths and limitations, will vary from package to package as a function of the relative "completeness" for the given package. This status will in turn affect what may be said regarding recommendations for use.

Earlier presentations have emphasized that a major portion of the competency-based curriculum document is comprised of formatted performance objectives with associated knowledges and skills. In the material which supplements this briefing, there will be found two examples of performance objectives chosen arbitrarily from the laboratory assistant curriculum

document.

In each curriculum document the user guidelines will appear first, followed by the much larger portion comprising the curriculum per se as segmented by training levels and, within them, the training units. Finally, the training units will be comprised of training modules which, in turn, consist of sequenced performance objectives.

Structuring Enlisted Careers

Substantial change in the nature of enlisted education and training is certain to have an effect upon the traditional patterns of careerism. Research to date, not only within the project team but involving several thousand active duty personnel in groups and individual interviews, has resulted in the development of a recommended overall career structure for enlisted personnel that holds high promise of more effective recruiting, more effective retention, more effective job satisfaction and an improved system of manpower utilization. In the course of developing this career structure, focus has shifted from NECs per se to ratings. The fact that the Hospital Corps has been confined to essentially one or two ratings for many years has been a serious confinement of careerism for enlisted personnel. It has made the system NEC-dependent. The present research has resulted in the identification of eleven proposed ratings, as noted in Figure 8. These ratings exceed by twice the number of provisional ratings identified by the NEOCS Study Group. The research suggests that these eleven ratings are the minimum number that the Medical Department can function with effectively. (One area, that of patient care, could achieve even more efficiency with some further identification of ratings.)

One can readily imagine that the entire depiction of the recommended career structure for enlisted personnel is physically quite large when made graphic. Figure 9 presents this structure in a large folded career chart in the accompanying materials. Note that the eleven career ratings are ranged in logical order and relationship under their particular labels. Heavily outlined boxes indicate the main course of the career in each rating. More lightly outlined boxes indicate either desirable career steps or career steps that have recently been designated but, in any event, reflect the recommendations of Quality Practice Control Boards.

At the far right, note that the proficiency levels identified and verified within the course of this research are readily

adapted to the levels and terminology of the NEOCS Study Group recommendations, if those recommendations are expanded to include a first trainee level (E1 - E2) and the identification of a Warrant Officer level between E9 and members of the professional corps.

Entry Training for Career Orientation

Figures 10 through 14 break down the overall career chart so that areas may be amplified for examination as well as indicating (by shading) the initial or specialty entry occupation areas where competency-based curricula are being developed.

Figure 10 reflects the research finding that personnel entering the laboratory field need not take the entire course of training represented by Class A Corps School. Thus, much training time may be saved. The same may be said of personnel entering specialty training in the radiation area.

On the other hand, personnel functioning in "operations" billets (shipboard, aviation, FMF) need to pass through the full A School curricula to be ready for subsequent training and responsibilities, as seen in Figure 11.

Likewise, as seen in Figure 12, all personnel passing into the career rating of patient care, whether in general patient care or specialty clinic areas, should pass through the entire sequence of Corps School training.

The closely associated support occupations are grouped in Figure 13. It will be evident from the shading that the research has found no basis for giving these personnel more orientation training than that associated with emergency and casualty care, thus saving much training time for rather large numbers of personnel.

Figure 14 indicates the two career paths in dental assisting and dental laboratory. It is recommended that Dental Class A School curricula be experienced in full for those going into dental assisting but dental laboratory candidates need pass through only emergency and casualty care training.

Finally, support materials present a large foldout career chart on which is superimposed the shaded areas just reviewed to indicate all of those entry points at which the competency-based curricula may be introduced.

SPECIAL DATA ANALYSES

Special analyses have been underway and are continuing, particularly in the area of manpower optimization, to determine the impact of task relationships between types of personnel and upon enlisted education and training as a function of task delegation on the part of professional personnel. Highlights of interim analytical results will be reviewed in order to capture the nature of the essential impact. Throughout our analyses, a very conservative decision rule has been used for the identification of a "delegable" task. To be so identified a task must be performed by at least 10 percent of the professional population surveyed, and it must be currently delegated or considered for future delegation by more than 50 percent of those who report doing it.

Work Time Distribution and Delegation Summary by Corps

Figure 16 presents an overall summary of delegation analysis of the more common administrative and patient care tasks for the Medical, Nurse and Dental Corps. Note that the task categories of administrative and patient care tasks are separated so that for the Medical Corps some 71 hours per month are spent on administrative tasks and 136 hours on patient care tasks, for an average monthly total effort of 207 hours. Thirty-eight hours of equivalent task time may be delegated for tasks that are also being currently performed by Medical Corps personnel; some 18 hours may be delegated in the future where training has been improved and the tasks are supervised; and some 13 hours with improved education and training may be delegated without supervision. Thus, a total of approximately 33 percent of the 207 hours represent time spent on tasks that are candidates for delegation. Similar interpretations may be made for the Nurse Corps and the Dental Corps.

MC Delegation Summary by Major Activity

Figure 17 breaks down the delegation summary for the Medical Corps by major activity, namely, dispensaries, fleet, and hospitals. Please note that the overall summary line at the top indicating that 468 physicians were processed in the sample for a total average monthly work time of 207 hours, with 34 percent of those hours spent on administration and 66 percent on patient care. Eighteen percent of those hours could currently be delegated and in the future with improved training, an additional 15 percent for a combined possible saving of approximately one-third of their total time.

When one considers the specific activities, however, savings may be more or less, as indicated in Figure 17 by activity.

It is possible to print out the specific lists of tasks represented by these percentages so that expert personnel may validate or alter them according to their collective opinion regarding the nature of the tasks and responsibilities. Attention must also be given to the fact that in certain billets it would be impossible to effect full delegation because of the nature of the billet. Hence, even though a highly conservative decision rule has been used in achieving these numbers, the potential savings of 33 percent across the board for the Medical Corps should be looked at as a potential upper limit; a more realistic time-saving target should be set at some level below that. The target-setting should be coordinated with examination of the competency-based curricula (and possible extensions to the latter) so as to be sure that enlisted personnel are prepared to engage more fully in the tasks delegated to them.

Percent Delegable Tasks by Medical Specialty

Figure 18 presents a bar graph which on the left indicates percent of delegable tasks by medical specialty. Two characteristics are notable; first, delegability varies by specialty, and secondly, delegability potential is high for virtually all specialties.

On the right in Figure 18, it is notable that delegability is not a function of middle or upper ranks but does tend to be a function of environment. Thus, more tasks are regarded as delegable by both levels of rank in the dispensaries than by both levels of rank in the hospitals.

Percent Delegable Tasks by Specialty: Nurse Corps

Figure 19 presents a similar picture except that the two characteristics noted for the Medical Corps are further emphasized for the Nurse Corps. It is also notable that lower, middle and upper grade ranks are not differentiable in terms of delegability.

Percent Delegable Tasks by Dental Specialty

In Figure 20 one may see at a glance that a similar pattern for delegability is evident for the Dental Corps. It would be expected that there be a significantly higher potential in general

dentistry than that for the various dental specialties, though even the latter have high delegation potential.

Impact on Education and Training of Commonality Delegability Analysis

Figure 21 presents a rather compelling pattern of delegability analysis for a major activity, namely, the dispensaries.

From the task analysis survey of personnel, it was determined that about 450 tasks describe the task repertoire of physicians, about 600 tasks for nurses, and a similar number for corpsmen. Of the 450 tasks performed by physicians, 227 were found delegable to corpsmen under the decision rule described. If transferred to corpsmen they would fill the contral area described by a dotted line at the top of the corpsmen column. Note that 42 tasks are already being performed in common by the physician and the corpsmen.

Of the 600 tasks performed by nurses, some 260 are found delegable in addition to 165 that are already being shared between nurses and corpsmen. If the 260 delegable tasks are added to the repertoire of the corpsmen, the central column would be expanded as shown by the lower dashed box. Note that 116 tasks are shared as common between physicians, nurses and corpsmen.

Within the middle area of the corpsmen task "boxes" one can note nine tasks performed by corpsmen that physicians regarded as non-delegable; also notable are 16 tasks falling within the common task area regarded as non-delegable by physicians and nurses; and an additional 19 common tasks regarded as non-delegable by nurses but being performed by corpsmen. These 44 tasks should be reviewed by medical specialists to determine whether training should prepare people to perform them or whether enlisted personnel should not perform them at all.

CLUSTER ANALYSIS

In the course of determining the functional limits and content areas peculiar to potentially delegable tasks, it is highly desirable to be able to access the data base from the viewpoint of procedural clusters. Some 34 clusters are now functional within the index and retrieval system for this and related purposes.

Figure 22 lists these clusters by title. It is possible to expand this list to at least 50 major clusters. It is also

possible to specify any necessary number of sub-clusters where, for example, one might wich to break down Patient History and Records, or Psychiatric Treatment and Counselling, or Pediatrics, etc. The computer software is programmed so that the operational user can use these clusters to retrieve tasks by procedural or specialty areas to answer questions having to do with commonality or delegability for purposes of adding functionally related tasks to the training repertoire of corpsmen.

Figure 23 presents a small portion of one cluster, namely, Patient History and Records for general medical practice in dispensaries. The total task cluster is actually much larger.

SYSTEM IMPLEMENTATION

This presentation has reviewed the major products to be made available for operational installation of the system. In some additional detail it has reviewed the status and nature of the competency-based curricula, the recommended rating structure for enlisted personnel, as well as the scope and potential of task delegation.

Some comments are in order regarding possible system implementation. Figure 24 outlines some of the major considerations for an implementation process to be phased over a period of two years. The first year would focus on installation per se and the second year the bringing of the system to more complete and orderly operation.

Planning and budgeting is a first consideration along with the identification and assignment of key personnel. Planning should encompass a proper perspective on phasing regarding all aspects of the current reality of the Navy Medical Department. Because the present curricula are based on a job analysis that was conducted three years ago, there should be a current update (using the operational inventories) carried out in parallel with the initial curriculum installation activity.

With reference to Figures 10 through 14, it is recommended that only initial curricula be first introduced into the field through a well-structured participation of field personnel. Only on-hand media and other support should be considered for initial implementation. Later in the year feed-back work shops should be established so that a central training cadre can obtain assessments of strengths and weaknesses and hence program refinements into the on-going process.

During the second year desirable modifications should be introduced, along with new media and possible vertical expansions of competency-based training into the higher levels of specialization. There should be a systematic program of "educating the educator" throughout the Navy Medical Department in the instructional strategies of competency-based training (a certain number of instructors will have been trained in the early part of the first year to undertake initial instructional efforts).

A systematic means of obtaining operational feedback from the field to the central training cadre should be established while, at the same time, according to plan, other system adjustments should be brought about. The latter would have to do with personnel distribution, billet identification, NEC restructuring, reformulation of qualifications, and the like. Finally, a plan for formal assessment of the on-going curricula should be carried out with a view to continuation in subsequent years.

Five steps are recommended for initial implementation activity following the development of an overall plan:

1. Establish a date for a workshop involving representatives from the designated schools and NMTI staff.

2. Charge this group with reviewing the curricula for omission or other faults; to focus upon what instructional strategies will be improved; to identify training aids that are available as well as those to be defined; to prepare examination items based upon existing tests and identify those to be constructed.

3. Disseminate all resulting material to all participants.

4. Establish a date for initial operations.

5. Conduct training orientation for instructional personnel in each affected school.

FOLLOW-ON RESEARCH

On several occasions this Committee has requested the identification of priority research which should be conducted at the conclusion of this parent project.

Somewhat more than three years ago the Surgeon General provided formal guidelines for the continuation of this project.

Within these guidelines he asked that every effort be made to apply the technology in related civilian fields so as to strengthen its application within Navy medicine. This guidance was implemented so that a number of major projects have been completed or are in process. Highlight data will now be reviewed selectively so as to illustrate significant research potentials of priority nature for the Navy Medical Department.

Task Sharing Between Physician and MEDEX

Figure 25 illustrates three tasks that were found to be heavily shared by physicians and MEDEX in numerous civilian practices. Technology developed in this study points up ways of focusing specifically upon increasing the interactive efficiency of pairs of professional or subprofessional personnel.

Group Practice Analysis

Figure 26 indicates the development of a technology which resulted in the actual dollar cost associated with the performance of a task in civilian group practice by various classes of personnel. It indicates the savings that can be achieved through task sharing and task delegation, or task reallocation.

Task Performance Pattern Analysis

Figure 27 indicates the pattern of task performance between categories of personnel in a rural health clinic. This kind of analysis (or technology) may be applied to any identifiable work center such as an OPD, a dispensary, a medical service in a hospital, an emergency room, or other. It permits the optimization of task assignment and task sharing in the health care delivery team.

Task Performance in Hospital Laboratories

Task performance has been determined for 600 laboratory workers in 51 Medicare approved laboratories in hospitals. In Figure 28, please note that there is found no significant difference between the CLA, the MLT, and the MT with regard to frequency of tasks performed. In Figure 29, however, it will be immediately evident that CLAs perform sophisticated tasks about as often as do MTs, while the same is true of simple tasks. A major finding was that task performance is a function of size of institution rather than amount of technical preparation. This is a significant finding for those who plan educational programs for the laboratory worker as well as for those who assign personnel to

billets.

House Officer Survey

Task analysis is currently being applied to determine the work distribution effort of interns and residents in 16 major specialties as listed in Figure 30. The sample design is spread over three inventory administrations within a 12 month period. The total target sample size is approximately 3,500 interns and residents drawn from 10 medical centers, and five large teaching hospitals with no major university affiliation.

Analysis of data will be directed toward the determination of intern/resident time allocation to patient service, teaching, learning and research. This will involve a multi-step analysis utilizing (1) and iterative clustering technique and (2) an expert panel review to validate task cluster definitions with regard to patient service, teaching, learning and research. Once cluster definitions are established time allocation on such clusters will be determined to describe specialties across medical centers, and medical centers across specialties.

NECESSARY CHANGE

Figure 31, Helping to Effect Necessary Change in the AVF Era, indicates the system origin within research and development making possible system operation in the education and training program so as to bring about anticipated and controlled change rather than change that is responsive to circumstantial pressure. It indicates as well the desirability of continued and controlled research involving matters touched upon above but directed as well to proficiency testing, improved work center efficiency, the determination of specific career satisfactions and the determination of health care needs so that the entire system can be focused most intensively upon the fulfillment of health care needs.

PRODUCTS

DATA MANAGEMENT SYSTEM
DATA ANALYSES
CURRICULA
USER DOCUMENTATION

OPERATIONAL SYSTEM TECHNOLOGY

DATA MANAGEMENT SYSTEM

INSTRUMENT BUILDING
INDEXING AND RETRIEVAL
ANALYSIS

⟩

SOFTWARE
CAPABILITY

DATA ANALYSES

RELIABILITY AND VALIDITY
MANPOWER OPTIMIZATION
COMPARATIVE STATISTICS

⟩

OBJECTIVE
GUIDELINES

CURRICULA

NEED-TO-KNOW ESSENTIALS
COMPETENCY-BASED
COST EFFECTIVE

OBJECTIVE
STANDARDIZATION

USER DOCUMENTATION

INVENTORIES

GUIDELINES

USER MANUAL

ORDERLY INSTALLATION

CURRICULA DEVELOPMENT STATUS

DEVELOPMENT/TECHNICAL

- NUCLEAR MEDICINE
- RADIATION X-RAY
- MEDICAL/DENTAL EQUIPMENT REPAIR
- EAR, NOSE, THROAT
- UROLOGY
- DERMATOLOGY
- NEUROPSYCHIATRIC
- ADVANCED GENERAL-INDEPENDENT DUTY

TECHNICAL/CRITICAL

- HEALTH CARE ADMINISTRATION
- DENTAL ASSISTING
- CARDIOPULMONARY
- OPERATING ROOM
- ORTHOPEDICS

CRITICAL/COMPLETION

- BASIC HOSPITAL CORPS SCHOOL
- OPHTHALMOLOGY
- DENTAL PROSTHETICS
- PHYSICAL THERAPY
- PREVENTIVE MEDICINE (ENVIRONMENTAL HEALTH)
- RESPIRATORY THERAPY
- MEDICAL LABORATORY
- PHARMACY

USER GUIDELINES

1. THE COMPETENCY-BASED CURRICULUM
2. DEVELOPMENT PROCESS
3. ORGANIZATION OF CURRICULUM COMPONENTS
4. APPLICATIONS
5. GUIDELINES FOR CURRICULUM USE IN TRAINING
6. STRENGTHS AND LIMITATIONS
7. RECOMMENDATIONS

Level: Laboratory (Level 2)

Cluster (1): Capillary Blood Specimen Collection

Tasks:

_____	Prepare site for capillary puncture, i.e., finger tip, toe, ear lobe or heel
_____	Collect blood in proper receptacles for tests requested
252011	Prepare blood film on slide
_____	Make appropriate dilutions when necessary

Performance Objective:

(Stimulus) Upon receipt of request to collect capillary blood specimen

(Behavior) The graduate will prepare site, collect capillary blood in proper receptacles and, when necessary, make blood films on slides and dilute specimens

(Conditions) Using alcohol sponges, hemolets, capillary tubes (with and without anticoagulants), glass slides, calibrated pipets, diluting fluids; with limited technical supervision

(Criteria) Blood must be obtained from site at which the circulation is adequate. The blood should be free-flowing and not diluted with tissue juices or alcohol. The blood film must be adequate and the dilutions should be accurately made.

(Consequence) Adequate capillary blood specimen for the tests requested is collected and prepared for analysis

Knowledges and Skills:

Appropriate body sites from which to obtain capillary blood

Appropriate methods for stimulating circulation at puncture site

Criteria for making adequate blood smear

Appropriate diluting fluids

Proper receptacle for specific test

Proper capillary puncture techniques

Procedures for filling capillary tubes from a puncture wound

Techniques and procedures for diluting with micropipets

Principles and procedures for making adequate peripheral blood films

Level: Laboratory (Level 2)

Cluster (2): Venous Blood Specimen Collection

Tasks:

_____ Position patient
_____ Select venipuncture site
_____ Prepare venipuncture site
_____ Perform venipuncture with vacutainer or with needle and syringe
_____ Collect adequate specimen
_____ Change vacutainer tube or syringe
_____ Label tubes

Performance Objective:

(Stimulus) Upon receipt of request for collection of venous blood specimen

(Behavior) The graduate will position patient, select and prepare venipuncture site, perform venipuncture, collect adequate and appropriately preserved or anticoagulated specimen and label tubes

(Conditions) Using alcohol sponge, tourniquet, vacutainer, needle, adaptor or needle and syringe, tubes with and without anticoagulants; with limited technical supervision

(Criteria) Clean, swift venipuncture with minimal patient trauma; the specimen collected must be in the appropriate amount and proper container for laboratory analysis

(Consequence) Adequate venous blood specimen collected for tests requested

(Next Action) Check venipuncture site for bleeding and apply bandaid if necessary; send specimen to appropriate area for testing

Knowledges and Skills:

Patient positioning for venipuncture

Proper venipuncture sites

Proper preservation (e.g., immediate cooling for ammonia or acid Phosphatase

Principles and use of anticoagulants

Use of vacutainer

Use of needle and syringe

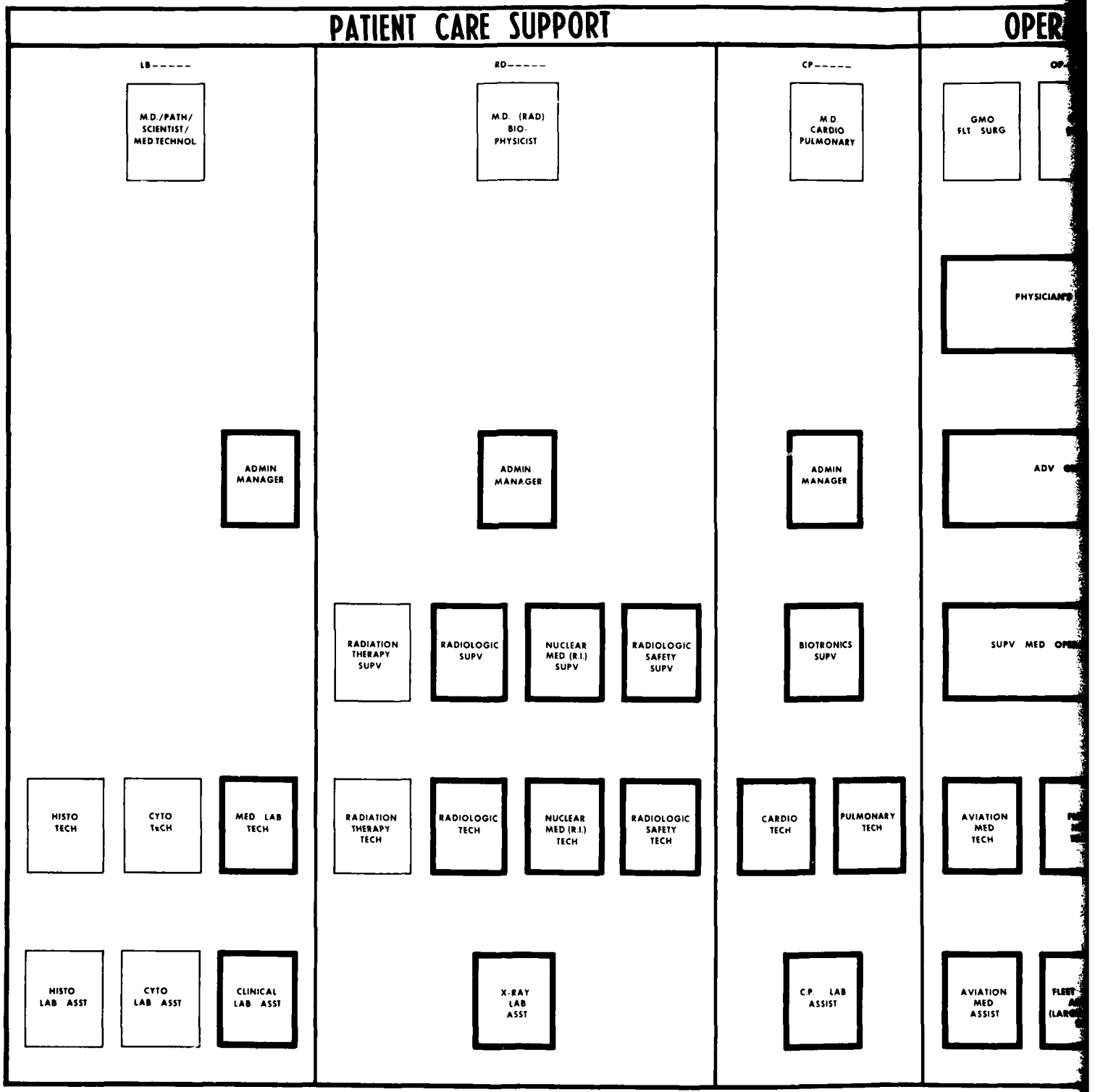
Proper tubes and anticoagulants to use for specific tests

Care of patient following venipuncture

Technique for venipuncture with minimum patient trauma

PROPOSED RATINGS

LB LABORATORY
RD RADIOLOGY
CP CARDIOPULMONARY
PC PATIENT CARE
PH PHARMACY
EM ENVIRONMENTAL HEALTH
OP OPERATIONS
(SHIPBOARD, AVIATION, FMF)
EQ EQUIPMENT REPAIR
DA DENTAL ASSISTANT
DL DENTAL LABORATORY
AD ADMINISTRATION


PATIENT CARE SUPPORT
OPER
LB-----
RD-----
CP-----
M.D./PATH/ SCIENTIST/ MED.TECHNOL
M.D. (RAD) BIO- PHYSICIST
M.D. CARDIO PULMONARY
GMO FLT SURG
PHYSICIANS
ADMIN MANAGER
ADMIN MANAGER
ADMIN MANAGER
ADV
RADIATION THERAPY SUPV
RADIOLOGIC SUPV
NUCLEAR MED (R.I.) SUPV
RADIOLOGIC SAFETY SUPV
BIOTRONICS SUPV
SUPV MED
HISTO TECH
CYTO TeCH
MED LAB TECH
RADIATION THERAPY TECH
RADIOLOGIC TECH
NUCLEAR MED (R.I.) TECH
RADIOLOGIC SAFETY TECH
CARDIO TECH
PULMONARY TECH
AVIATION MED TECH
HISTO LAB ASST
CYTO LAB ASST
CLINICAL LAB ASST
X-RAY LAB ASST
C.P LAB ASSIST
AVIATION MED ASSIST

OPERATIONS

OP-----

GMO FLT SURG

GMO (FLEET)

M.D. (USMC)

PHYSICIAN'S ASSISTANT

ADV GEN DUTY

SUPV MED OPERATIONS TECH

AVIATION MED TECH

FLEET MED TECH

AVIATION MED ASSIST

FLEET MED ASSIST (LARGE SHIPS)

COMBAT MED TECH

PATIENT CARE

PC-----

M.D. (OTO)

M.D. (OPHTHAL)

M.D. (DERM)

M.D. (ORTHO)

M.D. (UROLOGY)

M.D. (SURGERY)

M.D. (HOSPITALS DISPENSARIES)

R.N. (HOSPITAL DISPENSARIES)

PHYSICIAN'S ASSISTANT

SUPERVISORY CLINIC/O.R. TECH

SUPV PT. CARE TECH

AUDIO-METRY TECH

ENT TECH

OPHTHALMIC TECH

DERM TECH

ORTHO TECH

UROLOGY TECH

O.R. TECH

EMERGENCY ROOM TECH

PT. CARE TECH

ENT CLINIC ASSIST

OPHTHALMIC CLINIC ASSIST

DERM CLINIC ASSIST

ORTHO CLINIC ASSIST

UROLOGY CLINIC ASSIST

O.R. ASSIST

PT. CARE ASSIST

HOSPITAL CORPS TRAINEE

HEALTH CARE SUPPORT

PH-----

EH-----

EQ-----

M.D. (HOSPITALS DISPENSARIES)

R.N. (HOSPITALS DISPENSARIES)

M.D. PSYCH SOCIAL WORKER R.N.

M.D. P.T./O.T. R.N.

PHARMACIST PHARMA COLOGIST

M.D. ENVIR HEALTH SCIENTIST

BIOMED ENGINEER

ADV GEN DUTY

PHARMACY ADMIN MGR

REGIONAL MGR

REGIONAL MGR

SUPV PT. CARE TECH

SUPV M.H. TECH

SUPV P.T./O.T. TECH

SUPV PHARM TECH

E.H. SUPV

EQUIP REP SUPV

UNIT MANAGER

PT. CARE TECH

RESP THER TECH

MENTAL HEALTH TECH

PSYCH TECH

P.T./O.T. TECH

PHARMACY TECH

E.H. TECH

DENT EQUIP REP TECH

EQUIP REP TECH

X-RAY EQUIP REP SPEC

CARE ASSIST

RESP THER ASSIST

PSYCH AIDE

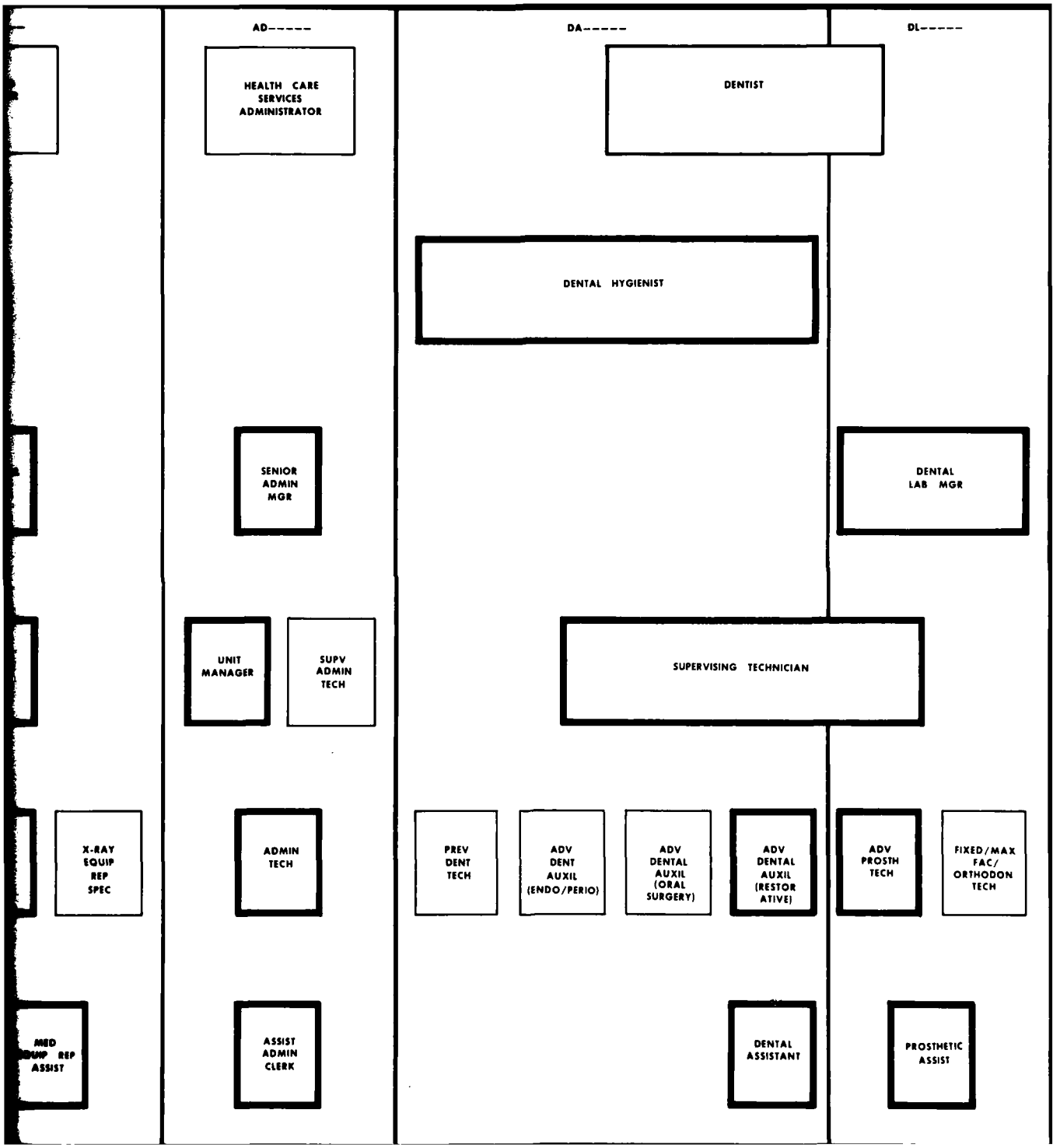
P.T./O.T ASSIST

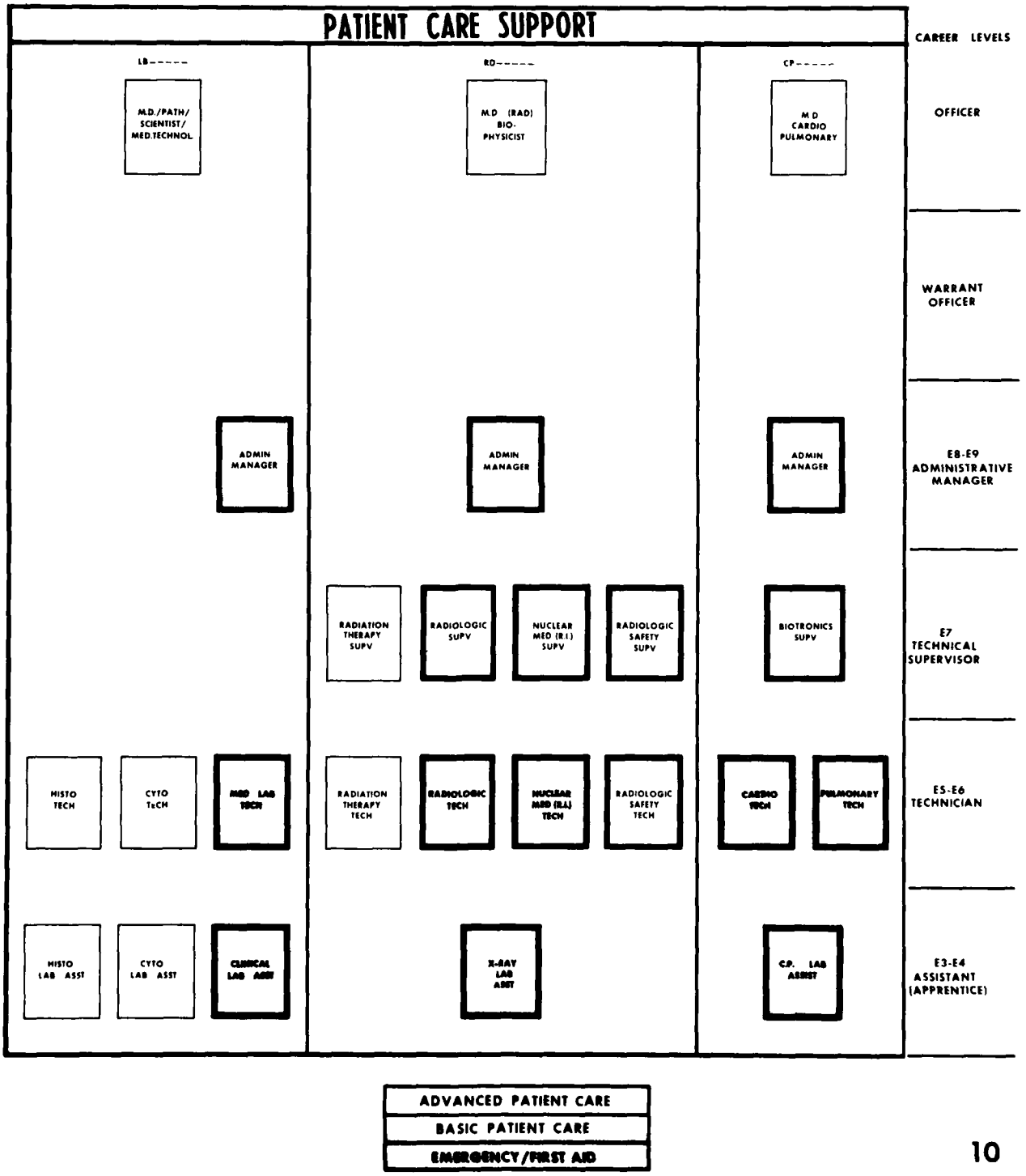
PHARM ASSIST

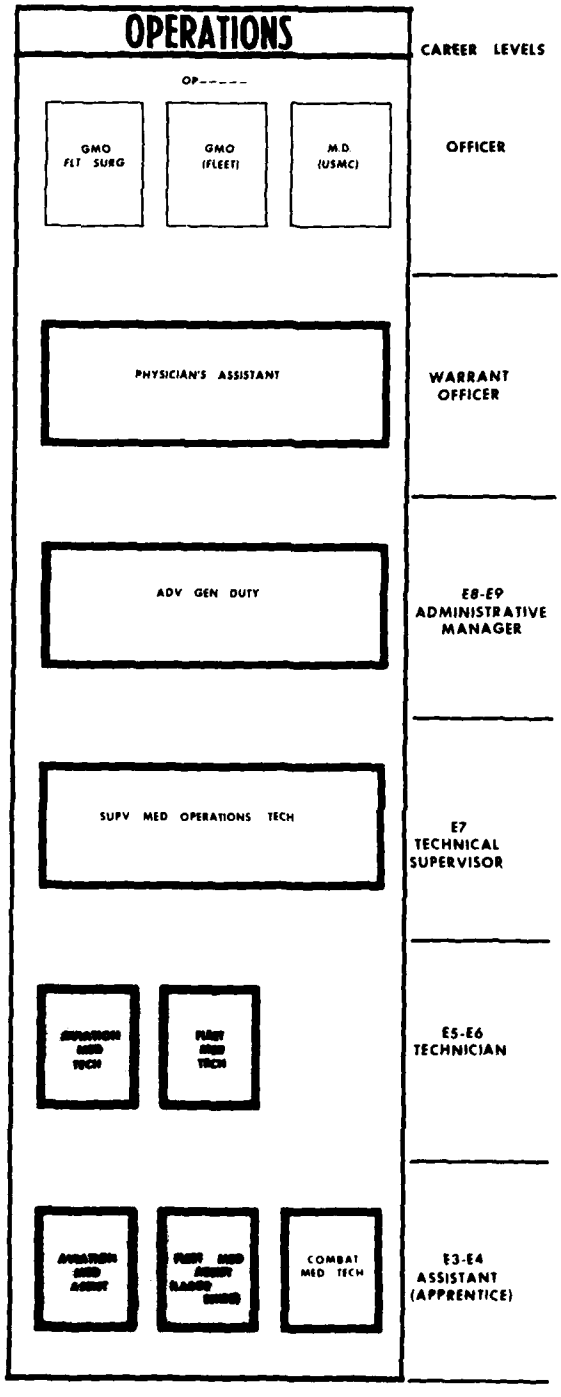
ENVIR HEALTH ASSIST

DENT EQUIP REP ASSIST

MED EQUIP REP ASSIST


AD-----
DA-----
DL-----
HEALTH CARE SERVICES ADMINISTRATOR
DENTIST
DENTAL HYGIENIST
SENIOR ADMIN MGR
DENTAL LAB MGR
UNIT MANAGER
SUPV ADMIN TECH
SUPERVISING TECHNICIAN
X-RAY EQUIP REP SPEC
ADMIN TECH
PREV DENT TECH
ADV DENT AUXIL (ENDO/PERIO)
ADV DENTAL AUXIL (ORAL SURGERY)
ADV DENTAL AUXIL (RESTOR ATIVE)
ADV PROSTH TECH
FIXED/MAX FAC/ ORTHODON TECH
ASSIST ADMIN CLERK
DENTAL ASSISTANT
PROSTHETIC ASSIST


PATIENT CARE SUPPORT
CAREER LEVELS
LB
RD
CP
M.D./PATH/ SCIENTIST/ MED.TECHNOL.
M.D (RAD) BIO-PHYSICIST
M D CARDIO PULMONARY
OFFICER
WARRANT OFFICER
ADMIN MANAGER
ADMIN MANAGER
ADMIN MANAGER
E8-E9 ADMINISTRATIVE MANAGER
RADIATION THERAPY SUPV
RADIOLOGIC SUPV
NUCLEAR MED (R.I.) SUPV
RADIOLOGIC SAFETY SUPV
BIOTRONICS SUPV
E7 TECHNICAL SUPERVISOR
HISTO TECH
CYTO TECH
MED LAB TECH
RADIATION THERAPY TECH
RADIOLOGIC TECH
NUCLEAR MED (R.I.) TECH
RADIOLOGIC SAFETY TECH
CARDIO TECH
PULMONARY TECH
E5-E6 TECHNICIAN
HISTO LAB ASST
CYTO LAB ASST
CLINICAL LAB ASST
X-RAY LAB ASST
C.P. LAB ASSIST
E3-E4 ASSISTANT (APPRENTICE)
ADVANCED PATIENT CARE
BASIC PATIENT CARE
EMERGENCY/FIRST AID

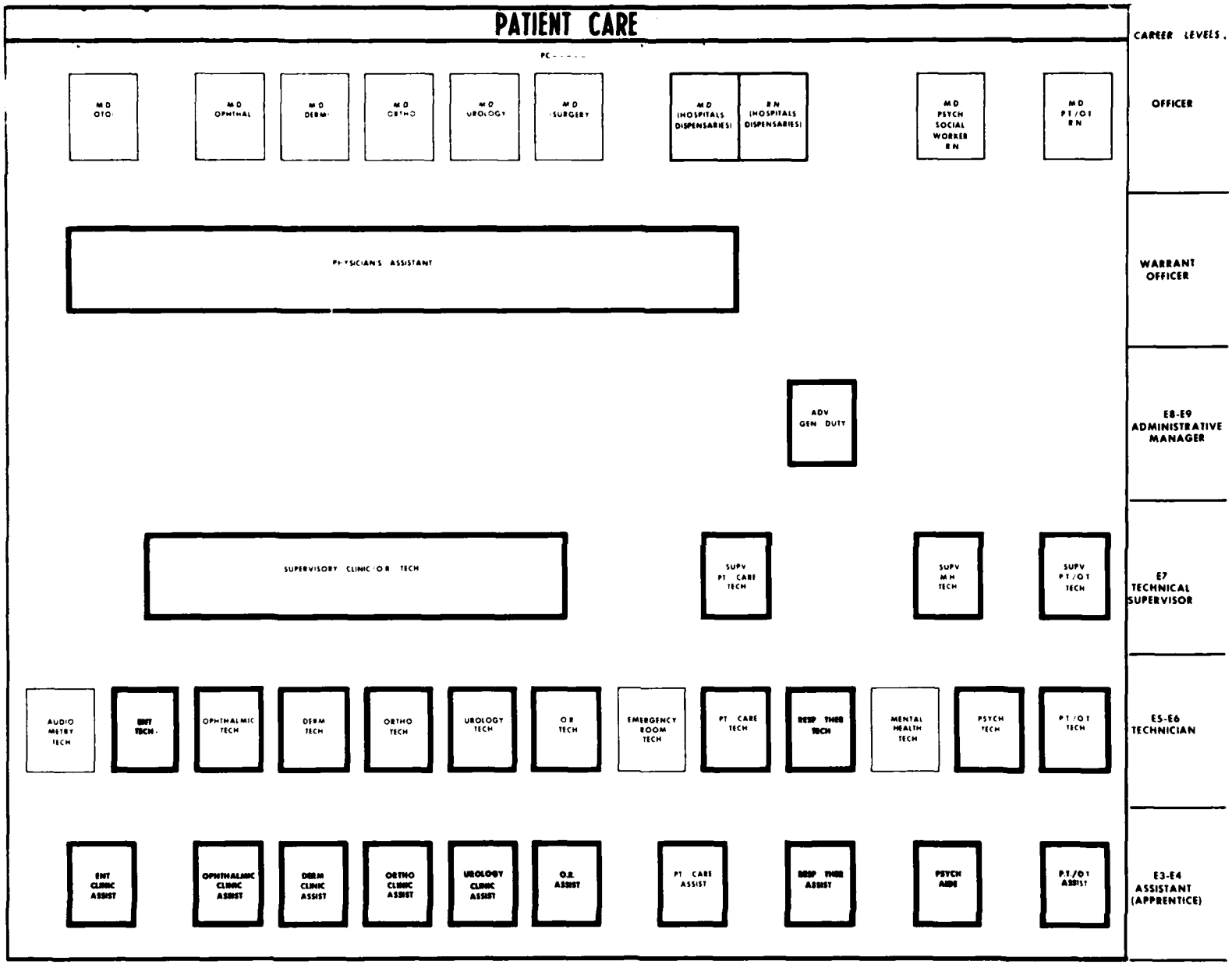


ADVANCED PATIENT CARE

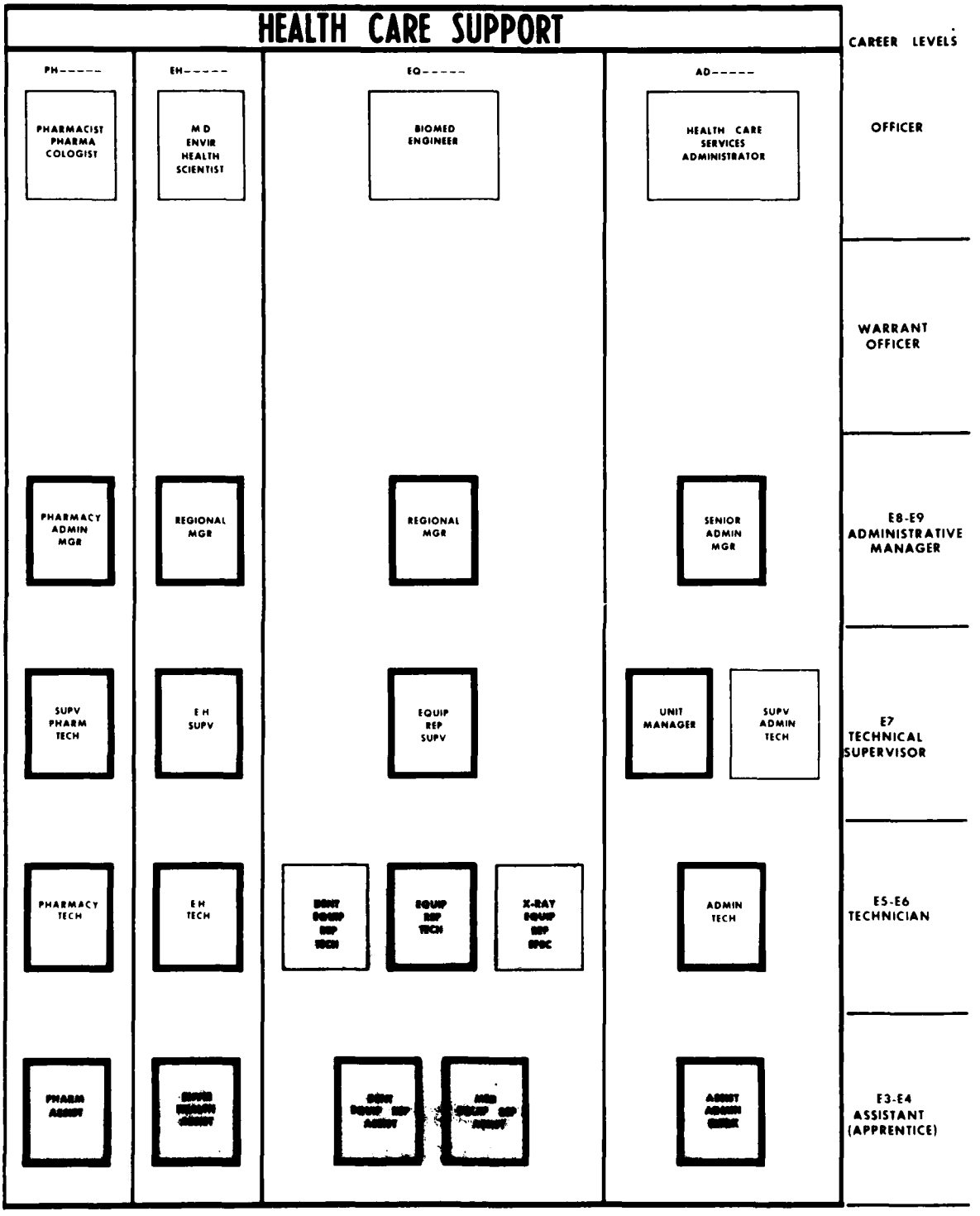
BASIC PATIENT CARE

EMERGENCY/FIRST AID

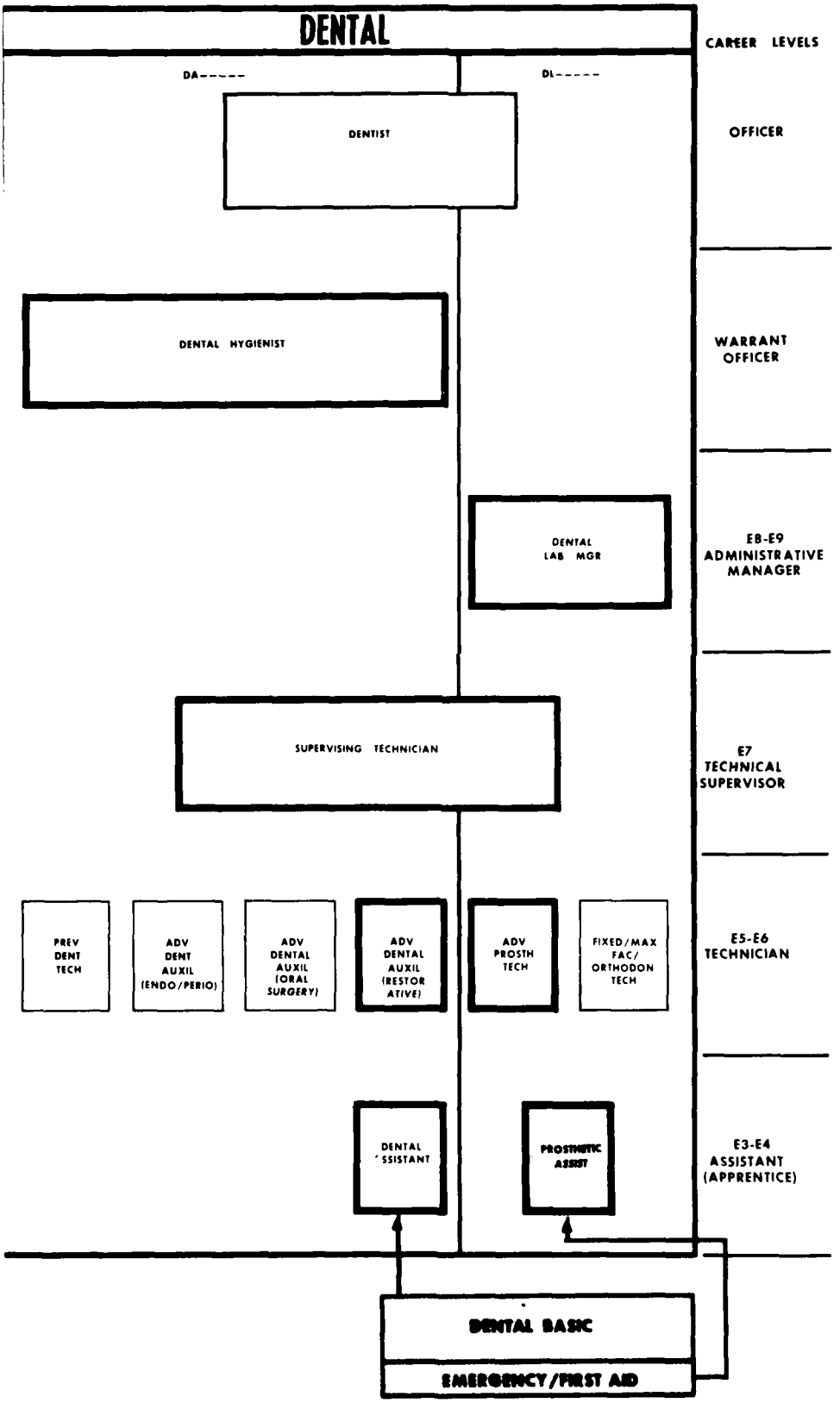
PATIENT CARE

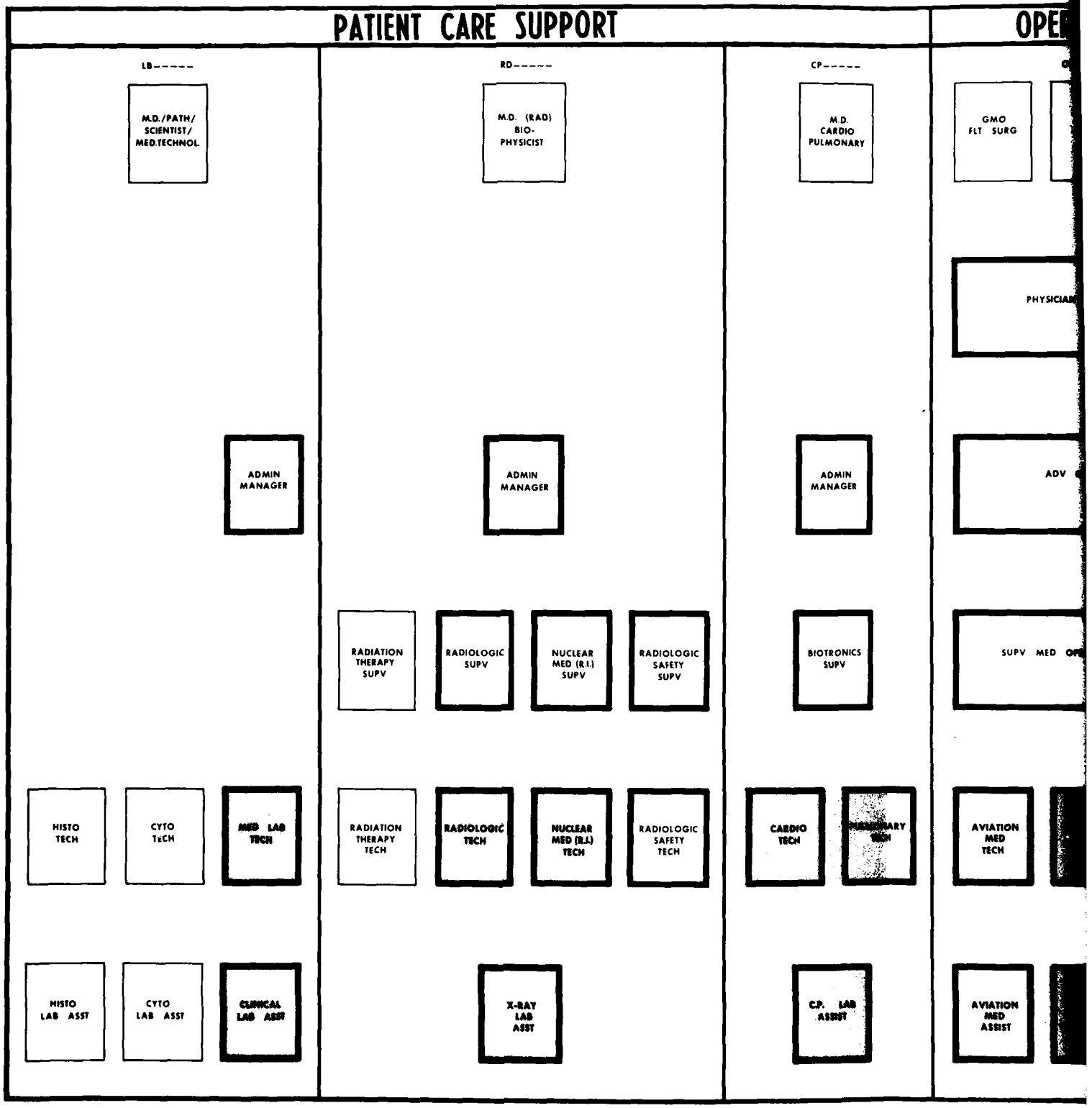


ADVANCED PATIENT CARE
BASIC PATIENT CARE
EMERGENCY/FIRST AID



ADVANCED PATIENT CARE
BASIC PATIENT CARE
EMERGENCY/FIRST AID


DENTAL
CAREER LEVELS
DA-----
DI-----
DENTIST
OFFICER
DENTAL HYGIENIST
WARRANT OFFICER
DENTAL LAB MGR
E8-E9 ADMINISTRATIVE MANAGER
SUPERVISING TECHNICIAN
E7 TECHNICAL SUPERVISOR
PREV DENT TECH
ADV DENT AUXIL (ENDO/PERIO)
ADV DENTAL AUXIL (ORAL SURGERY)
ADV DENTAL AUXIL (RESTOR ATIVE)
ADV PROSTH TECH
FIXED/MAX FAC/ ORTHODON TECH
E5-E6 TECHNICIAN
DENTAL ASSISTANT
PROSTHETIC ASSIST
E3-E4 ASSISTANT (APPRENTICE)
DENTAL BASIC
EMERGENCY/FIRST AID


PATIENT CARE SUPPORT
OPE
LB-----
RD-----
CP-----
M.D./PATH/ SCIENTIST/ MED.TECHNOL
M.D. (RAD) BIO- PHYSICIST
M.D. CARDIO PULMONARY
GMO FLT SURG
PHYSICIAN
ADMIN MANAGER
ADMIN MANAGER
ADMIN MANAGER
ADV
RADIATION THERAPY SUPV
RADIOLOGIC SUPV
NUCLEAR MED (R.I.) SUPV
RADIOLOGIC SAFETY SUPV
BIOTRONICS SUPV
SUPV MED OPS
HISTO TECH
CYTO TECH
MED LAB TECH
RADIATION THERAPY TECH
RADIOLOGIC TECH
NUCLEAR MED (R.I.) TECH
RADIOLOGIC SAFETY TECH
CARDIO TECH
PULMONARY TECH
AVIATION MED TECH
HISTO LAB ASST
CYTO LAB ASST
CLINICAL LAB ASST
X-RAY LAB ASST
C.P. LAB ASSIST
AVIATION MED ASSIST

INITIAL COMPETENCY BASED TRAININ

OPERATIONS

OP-----

MO SURG

GMO (FLEET)

M.D. (USMC)

PHYSICIAN'S ASSISTANT

ADV GEN DUTY

SUPV MED OPERATIONS TECH

FLEET MED TECH

FLEET MED ASSIST (RADIO SHIPS)

COMBAT MED TECH

PATIENT CARE

PC-----

M.D. (OTO)

M.D. (OPHTHAL)

M.D (DERM)

M.D. (ORTHO)

M.D. (UROLOGY)

M.D. (SURGERY)

M.D. (HOSPITALS DISPENSARIES)

R.N. (HOSPITAL DISPENSARIES)

PHYSICIAN'S ASSISTANT

SUPERVISORY CLINIC/O R TECH

SUPV PT CARE TECH

AUDIO METRY TECH

ENT TECH

OPHTHALMIC TECH

DERM TECH

ORTHO TECH

UROLOGY TECH

O R TECH

EMERGENCY ROOM TECH

PT CARE TECH

ENT CLINIC ASSIST

OPHTHALMIC CLINIC ASSIST

DERM CLINIC ASSIST

ORTHO CLINIC ASSIST

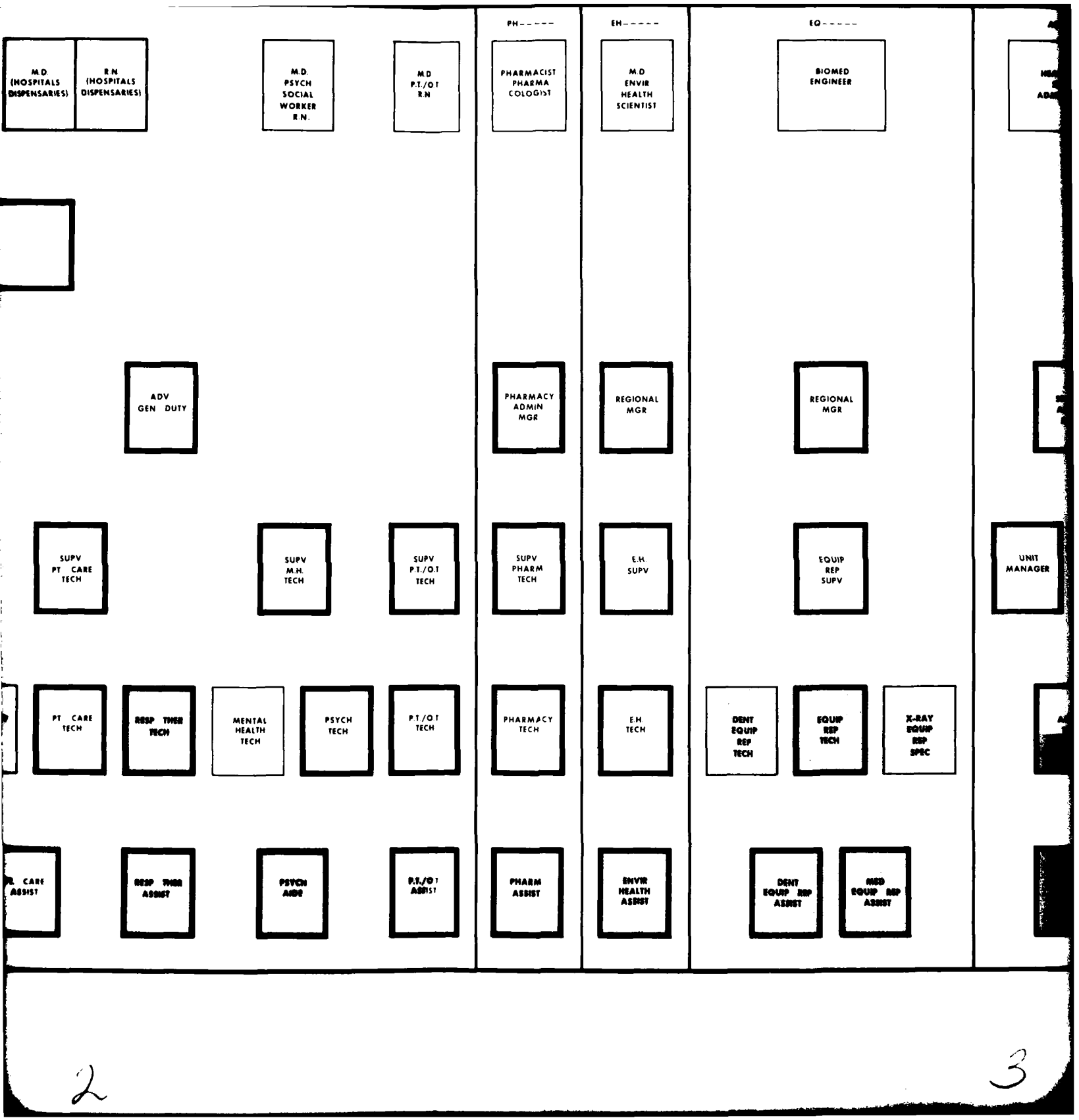
UROLOGY CLINIC ASSIST

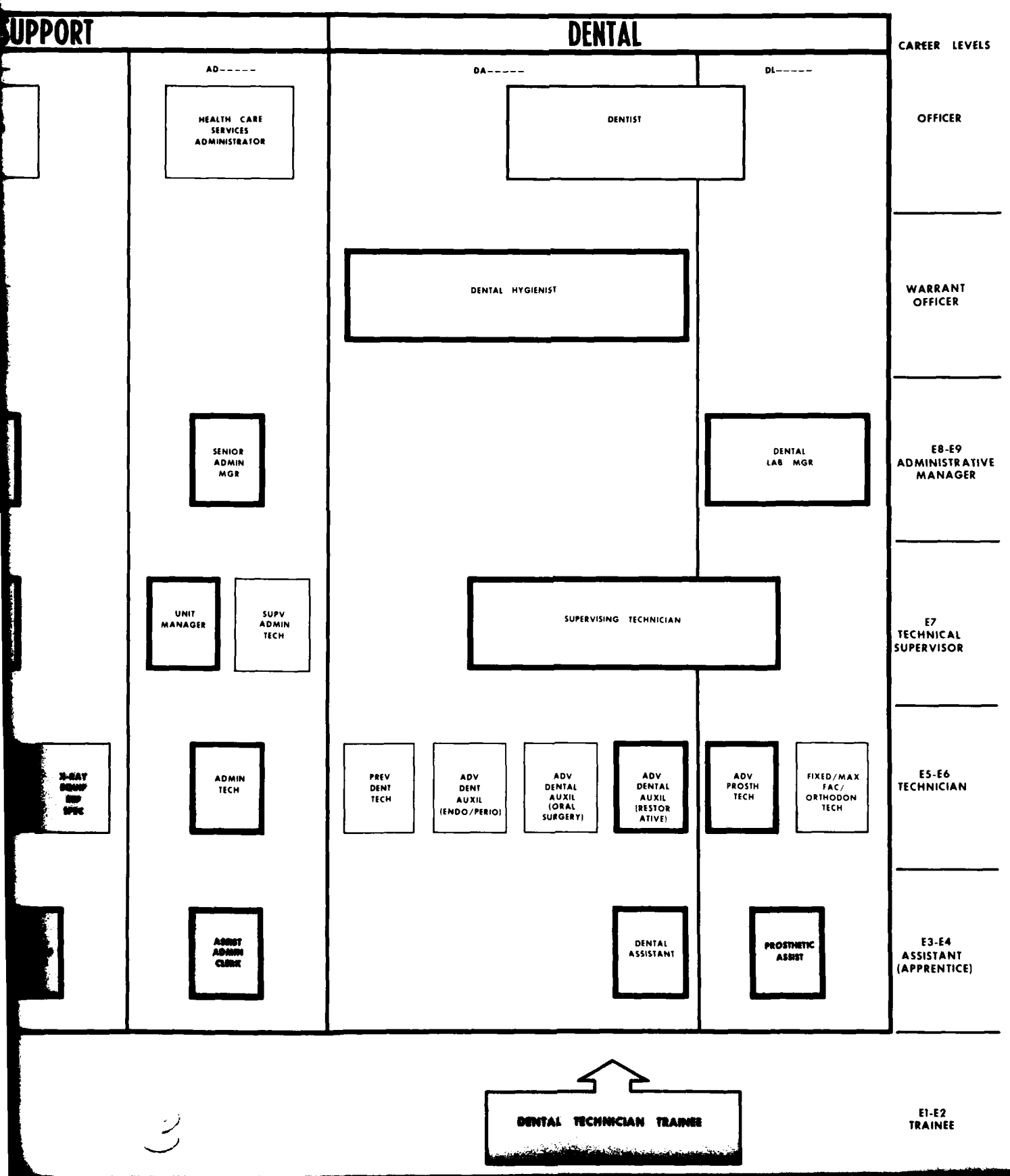
O.R. ASSIST

PT CARE ASSIST

HOSPITAL CORPS TRAINEE

2


PH-----
EH-----
EQ-----
M.D. (HOSPITALS DISPENSARIES)
R.N (HOSPITALS DISPENSARIES)
M.D. PSYCH SOCIAL WORKER R.N.
M.D P.T./O.T R.N
PHARMACIST PHARMA COLOGIST
M.D ENVIR HEALTH SCIENTIST
BIOMED ENGINEER
ADV GEN DUTY
PHARMACY ADMIN MGR
REGIONAL MGR
REGIONAL MGR
SUPV PT CARE TECH
SUPV M.H. TECH
SUPV P.T./O.T TECH
SUPV PHARM TECH
E.H. SUPV
EQUIP REP SUPV
UNIT MANAGER
PT CARE TECH
RESP THER TECH
MENTAL HEALTH TECH
PSYCH TECH
P.T./O.T TECH
PHARMACY TECH
E.H. TECH
DENT EQUIP REP TECH
EQUIP REP TECH
X-RAY EQUIP REP SPEC
PSYCH AIDE
P.T./O.T ASSIST
PHARM ASSIST
ENVIR HEALTH ASSIST
DENT EQUIP REP ASSIST
MED EQUIP REP ASSIST


SUPPORT
DENTAL
CAREER LEVELS
AD-----
DA-----
DL-----
HEALTH CARE SERVICES ADMINISTRATOR
DENTIST
OFFICER
DENTAL HYGIENIST
WARRANT OFFICER
SENIOR ADMIN MGR
DENTAL LAB MGR
E8-E9 ADMINISTRATIVE MANAGER
UNIT MANAGER
SUPV ADMIN TECH
SUPERVISING TECHNICIAN
E7 TECHNICAL SUPERVISOR
ADMIN TECH
PREV DENT TECH
ADV DENT AUXIL (ENDO/PERIO)
ADV DENTAL AUXIL (ORAL SURGERY)
ADV DENTAL AUXIL (RESTOR ATIVE)
ADV PROSTH TECH
FIXED/MAX FAC/ ORTHODON TECH
E5-E6 TECHNICIAN
DENTAL ASSISTANT
PROSTHETIC ASSIST
E3-E4 ASSISTANT (APPRENTICE)
DENTAL TECHNICIAN TRAINEE
E1-E2 TRAINEE

WORK TIME DISTRIBUTION AND DELEGATION SUMMARY BY CORPS

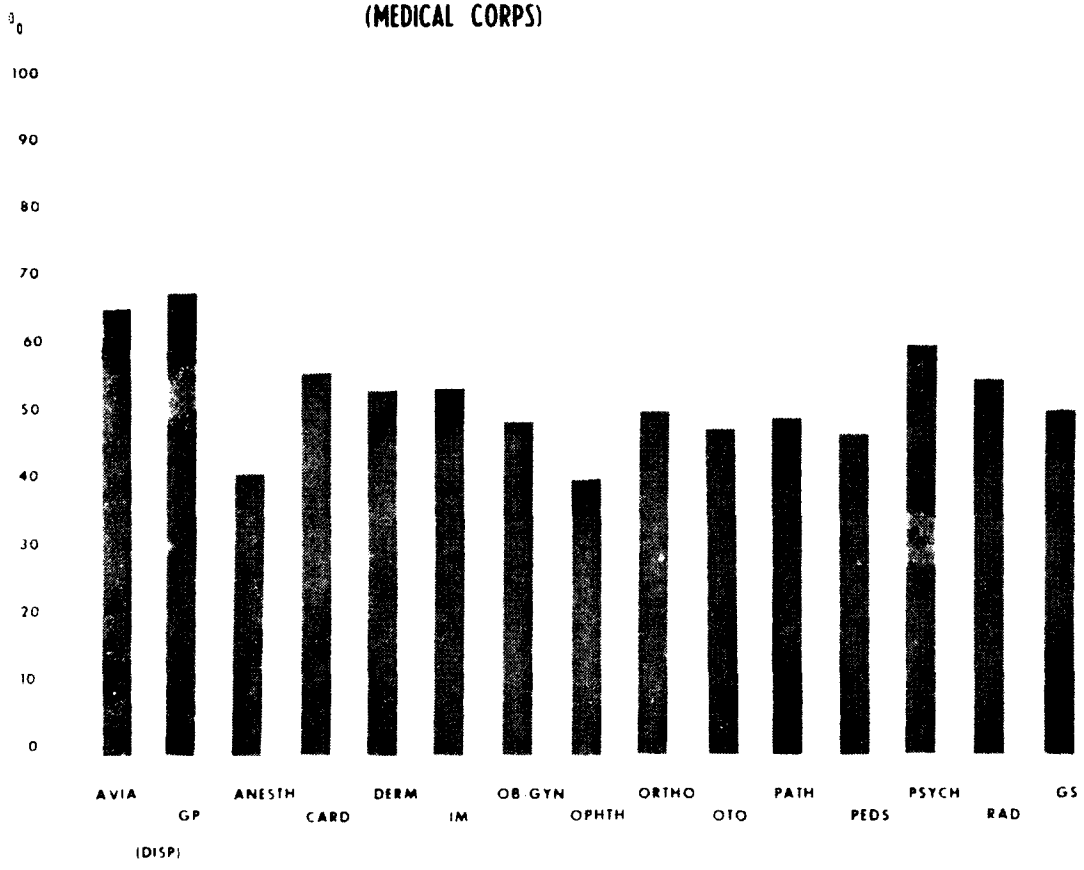
CORPS	N	TASK CATEGORY	TOTAL TIME IN HOURS SPENT/MONTH ON CATEGORY	COMMON ADMIN. AND PATIENT CARE TASKS					
				TIME SPENT ON TASKS CURRENTLY BEING DELEGATED		FUTURE DELEGATION WITH SUPERVISION		FUTURE DELEGATION W/O SUPERVISION	
				HOURS	PERCENT	HOURS	PERCENT	HOURS	PERCENT
MEDICAL	468	ADMIN.	71	15	7	4	2	3	1
		PT. CARE	136	23	11	14	7	10	5
			207	38	18	18	9	13	6
NURSE	406	ADMIN.	106	61	30	7	4	2	1
		PT. CARE	97	57	28	7	3	4	2
			203	118	58	14	7	6	3
DENTAL	332	ADMIN.	64	12	6	3	2	1	1
		PT. CARE	139	39	19	19	9	2	1
			203	51	25	22	11	3	2

MEDICAL CORPS DELEGATION SUMMARY BY MAJOR ACTIVITY

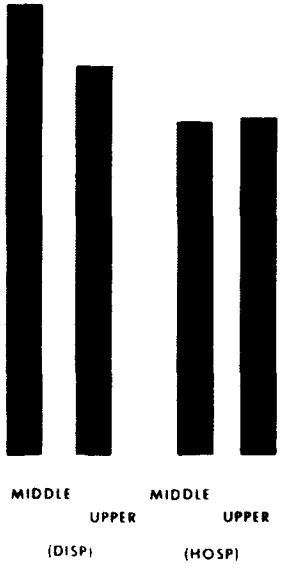
SAMPLE	NUMBER	TOTAL HRS. SPENT ON TASKS	PERCENT TIME ADMIN	PERCENT TIME PT. CARE	PERCENT TIME CURRENT DELEGABLE	PERCENT TIME FUTURE DELEGABLE	PERCENT TIME TOTAL DELEGABLE
TOTAL	468*	207	34	66	18	15	33
DISPENSARIES	126	214	30	70	24	18	42
FLEET	31	200	42	57	32	10	42
HOSPITALS	287	208	30	70	15	15	30

*24 M.D.s IN MISCELLANEOUS ENVIRONMENTS NOT INCLUDED IN SUBSAMPLE MAJOR ACTIVITIES.

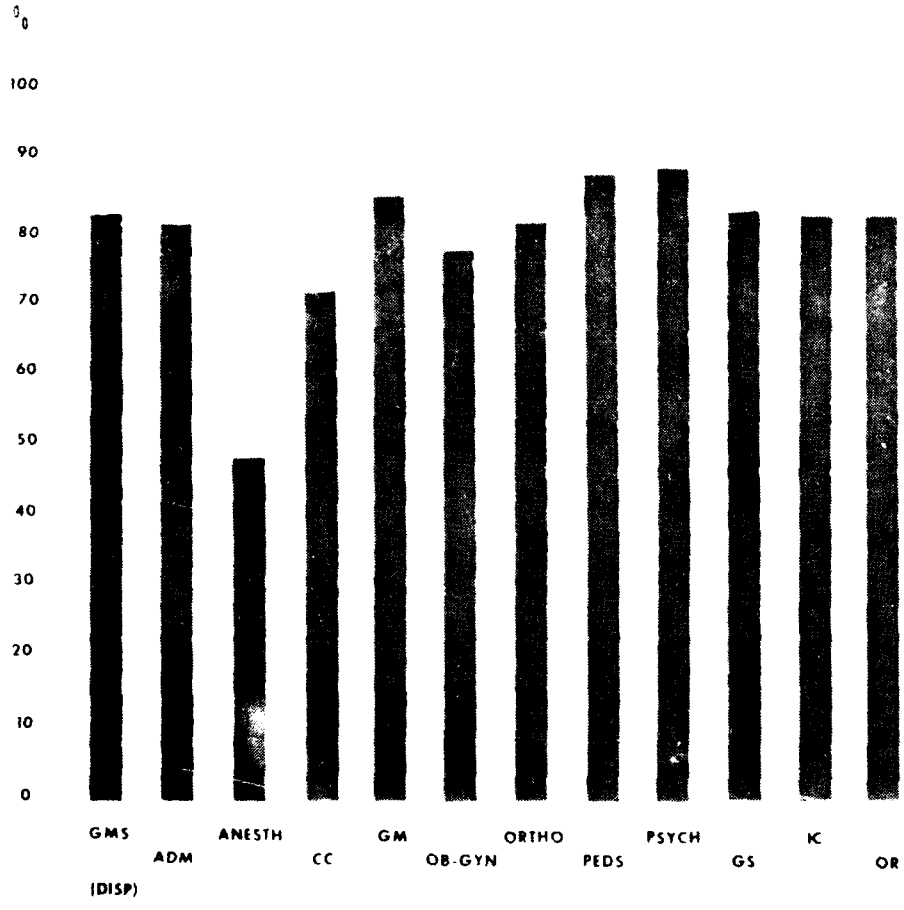
PERCENT OF DELEGABLE TASKS BY SPECIALTY (MEDICAL CORPS)



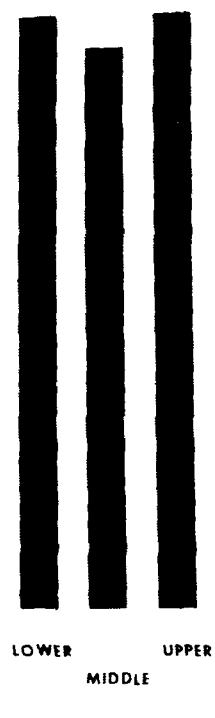
PERCENT OF DELEGABLE TASKS BY RANK (MEDICAL CORPS)



PERCENT OF DELEGABLE TASKS BY SPECIALTY
(NURSE CORPS)

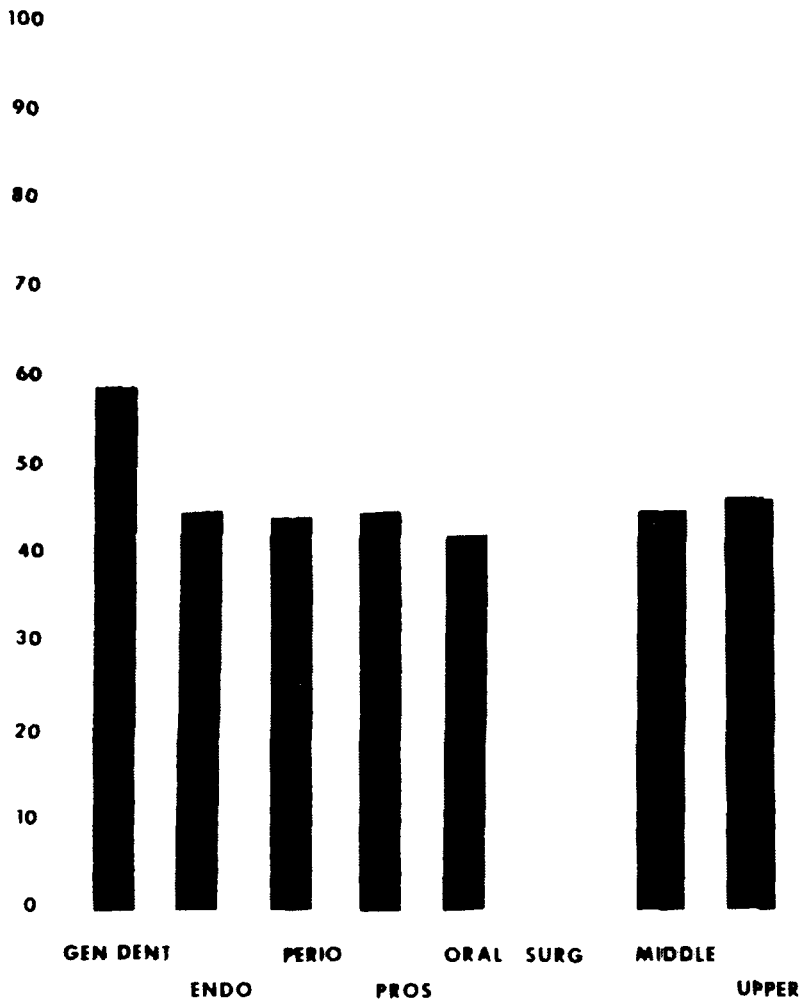


PERCENT OF DELEGABLE TASKS BY RANK
(NURSE CORPS IN HOSPITALS)

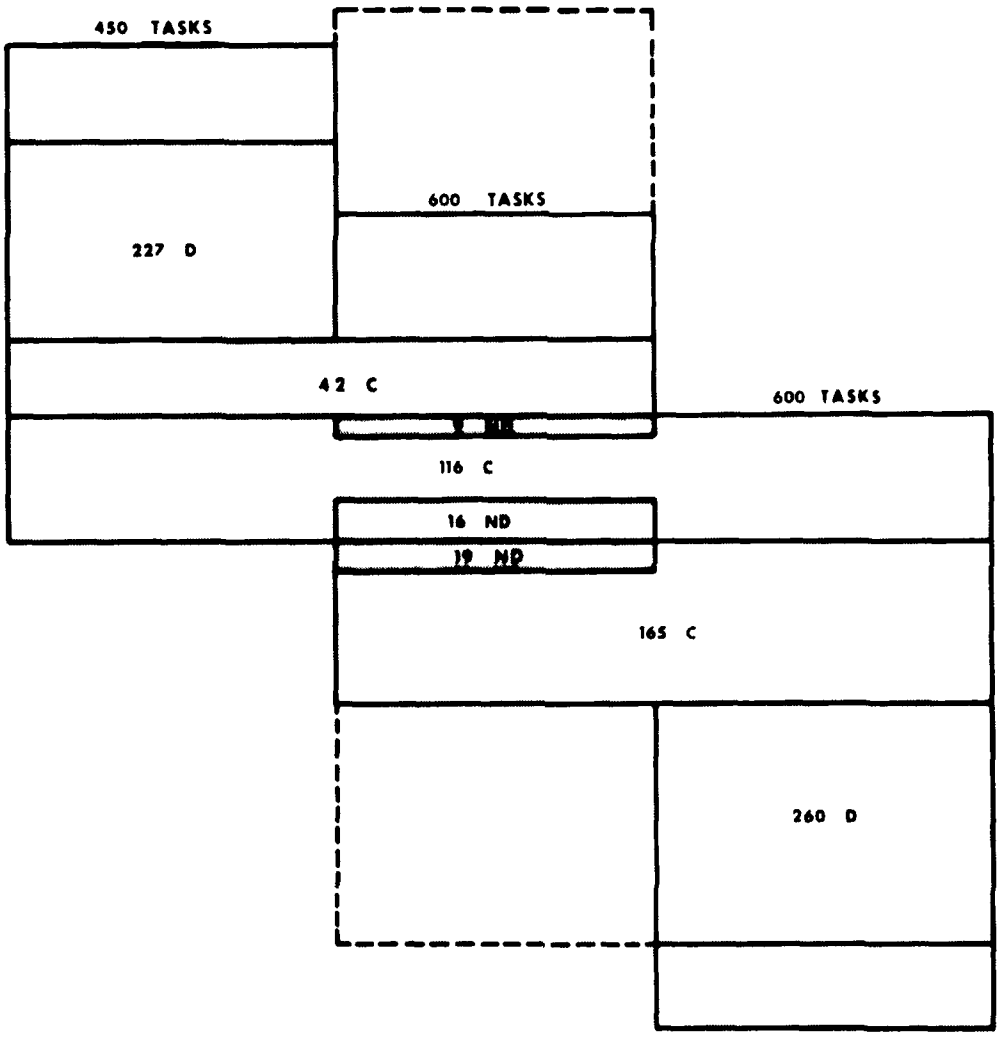


PERCENT OF DELEGABLE TASKS BY SPECIALTY (DENTAL CORPS)

PERCENT OF DELEGABLE TASKS BY RANK (DENTAL CORPS)



IMPACT ON EDUCATION AND TRAINING OF COMMONALITY/DELEGABILITY



COMMON TASKS

ADDITIONAL DELEGABLE TASKS

NONDELEGABLE TASKS

CLUSTER TITLES

PATIENT HISTORY AND RECORDS

PATIENT SCHEDULING

PRESCRIPTION AND MEDICATIONS

DRUG ADMINISTRATION (OTHER THAN ANESTHETICS)

EMERGENCY SURGICAL PROCEDURE

OTHER EMERGENCY PROCEDURES

RADIOLOGIC TECHNIQUES AND PROCESSING

RADIOLOGIC PROCEDURES

PSYCHIATRIC TREATMENT AND COUNSELING

PSYCHIATRIC ASSESSMENT AND OTHER PROCEDURES

COMMUNITY SERVICES

PEDIATRICS

OBGYN AND PERINATAL SURGERY

OTHER OBGYN AND NEWBORN

ANESTHESIOLOGY

SURGICAL TREATMENT PROCEDURES

OTHER SURGICAL PROCEDURES

PATIENT INSTRUCTION

SPECIMEN COLLECTION

DIAGNOSTIC TESTING OTHER THAN X-RAY

LABORATORY PROCEDURES

CARDIOPULMONARY

NEUROLOGY

ORTHO AND PHYSICAL MEDICINE (NONSURGICAL)

DERMATOLOGY

GI-GU (NONSURGICAL)

PHARMACEUTICALS

PERSONNEL ADMINISTRATION AND RECORDS

SUPPLY

CLINICAL AND OTHER RECORDS

OTHER PATIENT EXAMINATION PROCEDURES

OTHER TREATMENT PROCEDURES

OTHER CLERICAL AND LOGISTIC

EXAMPLE OF A TASK CLUSTER

SUBPOPULATION GENERAL PRACTICE IN DISPENSARIES

CLUSTER TITLE: PATIENT HISTORY AND RECORDS

150078	ASK PATIENT/CHECK CHART FOR CONTRAINDICATION FOR TEST OR TREATMENT
330022	CHECK RECORDS FOR UP-TO-DATE IMMUNIZATIONS/X-RAYS/PHYSICALS
130656	OBTAIN PATIENT'S CHIEF COMPLAINT
130657	OBTAIN SYSTEMS REVIEW (HISTORY)

SYSTEM IMPLEMENTATION

FIRST YEAR — INSTALLATION

- PLANNING AND BUDGETING
- PERSONNEL
- PHASING
- JOB ANALYSIS UPDATE
- FIELD PARTICIPATION
- INITIAL CURRICULA FIRST
- ON-HAND MEDIA AND SUPPORT
- FEEDBACK WORKSHOPS
- REFINEMENT

SECOND YEAR — SYSTEMATIZING

- MODIFICATION
- NEW MEDIA INTRODUCTION
- EXPANSION
- EDUCATING THE EDUCATOR
- OPERATIONAL FEEDBACK
- SYSTEM ADJUSTMENTS
- FORMAL ASSESSMENTS

OPERATIONAL

SHARED TASKS BETWEEN MD & MDX

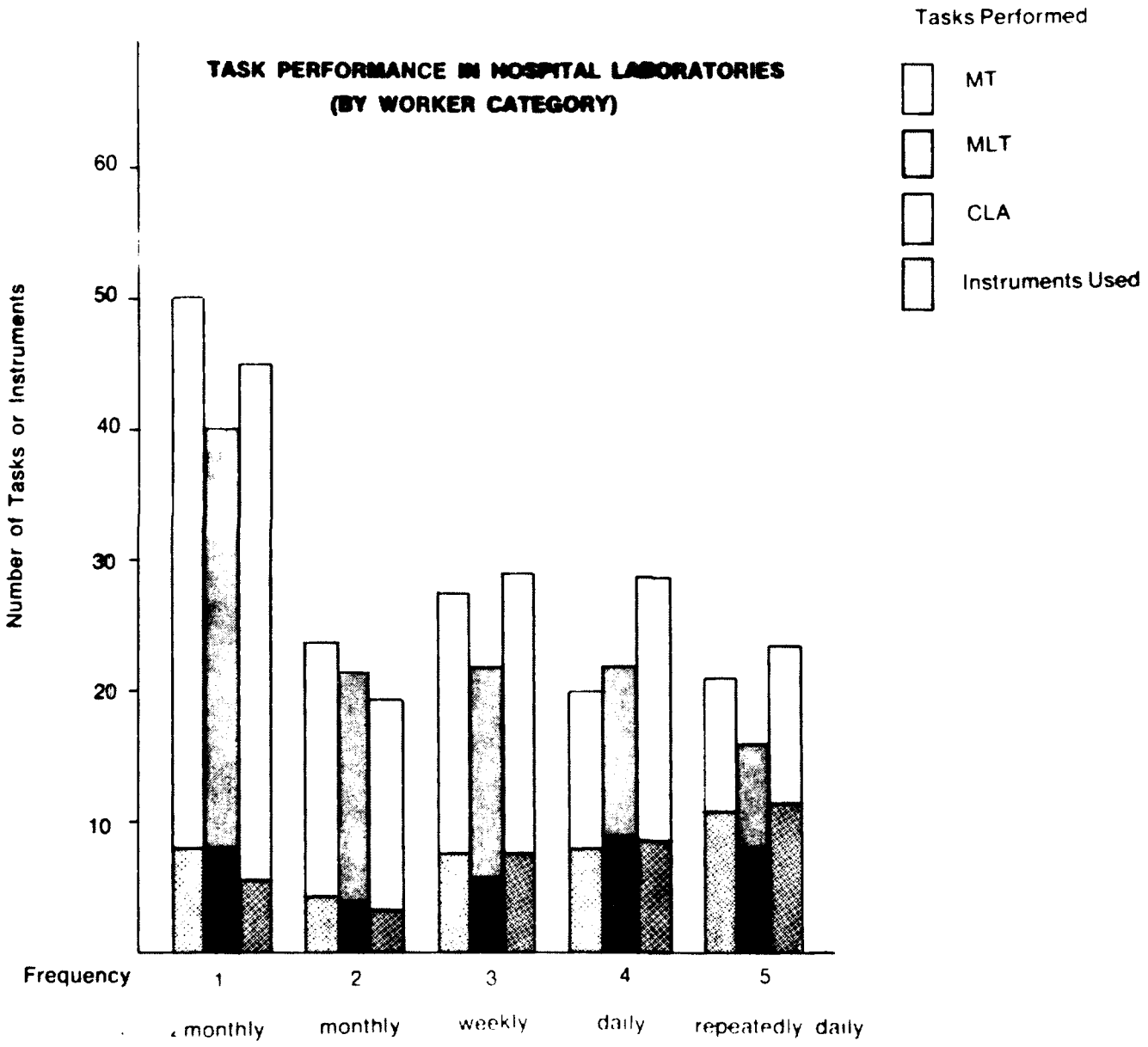
TASK	MD %DO	MD F	MDX %DO	MDX F
Examine eyes externally (i.e., conjunctiva, extraccular muscles, pupillary reaction)	100	51	97	50
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Examine joints for range of motion, swelling, internal derangement, tenderness	[redacted]	[redacted]	[redacted]	[redacted]

COST ANALYSIS IN GROUP PRACTICE CLINICS

Task ID	Task Statement	Avg. % Time Spent on Task				Avg. $ Cost (Dept. of Med.)
		MD	RN	LN	REC.	
530081	Obtain Pertinent Medical History	8.80	.00	.00	.00	306.73
[redacted]	[redacted]	5.80	3.45	2.15	.00	204.09
130656	Obtain Patient's Chief Complaint	4.15	5.88	5.53	2.37	191.78

TASK PERFORMANCE PATTERNS IN A RURAL HEALTH CLINIC

		MD	RN	LPN	OTHERS	TOTALS
MD	Tasks	253	29	33	120	435
	% Time	49.87	3.43	7.49	40.27	101.06
RN	Tasks	29	[illegible]	40	[illegible]	222
	% Time	2.67	[illegible]	21.23	[illegible]	100.12
LPN	Tasks	33	40	[illegible]	121	214
	% Time	6.54	25.45	[illegible]	61.32	99.73
OTHERS	Tasks	3	12	5	76	96
	% Time	3.13	14.70	3.78	78.58	100.19


TASK PERFORMANCE IN HOSPITAL LABORATORIES
(BY WORKER CATEGORY)
Tasks Performed
MT
MLT
CLA
Instruments Used
Number of Tasks or Instruments
60
50
40
30
20
10
Frequency
1
2
3
4
5
monthly
monthly
weekly
daily
repeatedly daily

TASK PERFORMANCE IN HOSPITAL LABORATORIES

(by worker category)

TASK	WORKER CATEGORY		
	MT	MLT	CLA
Do differential blood cell counts	65%		85%
Do WBC count of spinal fluid	59%		66%
Calibrate equipment	59%		56%
Determine bilirubin	53%		76%
Do direct Coomb's	49%		66%
Crossmatch blood	46%		69%

MEDICAL SPECIALTIES

Anesthesiology

Dermatology

Family Medicine

General Surgery

Internal Medicine

Neurology

Neurological Surgery

Obstetrics and Gynecology

Ophthalmology

Orthopedic Surgery

Otolaryngology

Pathology

Pediatrics

Psychiatry

Radiology

Urology

HELPING TO EFFECT NECESSARY CHANGE IN THE AVF ERA

R&D

(SYSTEM ORIGIN)

EDUCATION AND TRAINING
OPERATIONS

ANTICIPATED AND
CONTROLLED CHANGE

- PROFICIENCY TESTING
- WORK CENTER EFFICIENCY
- CAREER SATISFACTIONS
- HEALTH CARE NEEDS